UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ILLINOIS

UNITED STATES OF AMERICA, STATE OF ILLINOIS, Plaintiffs, v. KERR-MCGEE CHEMICAL LLC, Defendant.	CIVIL ACTION NO. ___________

VOLUME 10

OF 11

APPENDICES TO CONSENT DECREE

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IN UNITED STATES AND ILLINOIS V. KERR-MCGEE CHEMICAL LLC
(N.D. ILLINOIS)

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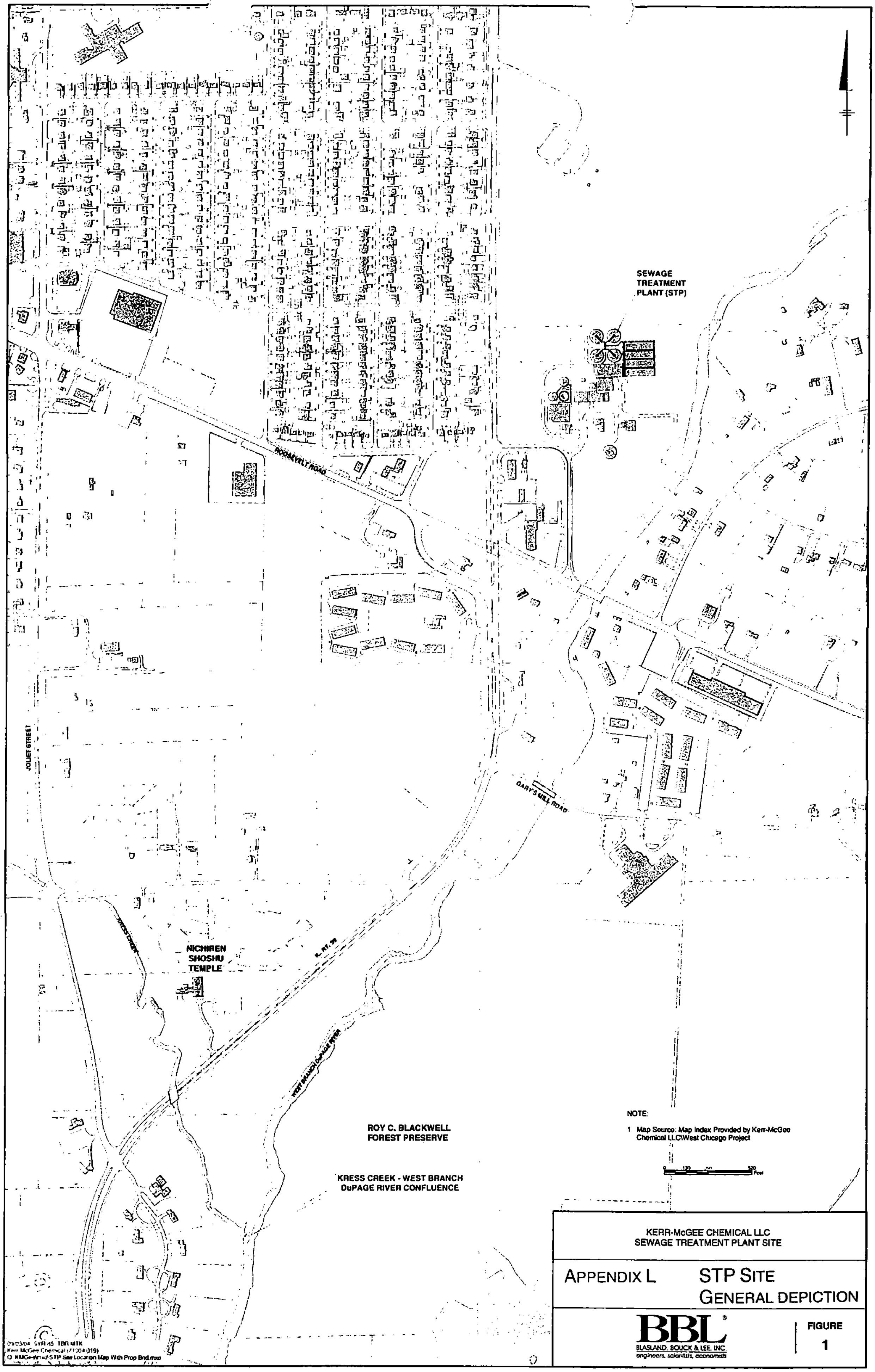
Consent Decree in the matter of United States and Illinois v. Kerr-McGee Chemical LLC, relating to the Kerr-McGee West Chicago NPL Sites.

APPENDIX L

GENERAL DEPICTION OF THE STP SITE


SEWAGE TREATMENT PLANT (STP)
ROOSEVELT ROAD
JOLIET STREET
GARY'S MILL ROAD
NICHIREN SHOSHU TEMPLE
KRESS CREEK
IL RT. 59
WEST BRANCH DuPAGE RIVER
ROY C. BLACKWELL FOREST PRESERVE
KRESS CREEK - WEST BRANCH DuPAGE RIVER CONFLUENCE
NOTE:
1 Map Source: Map Index Provided by Kerr-McGee Chemical LLC\West Chicago Project
0 120 520 Feet
KERR-McGEE CHEMICAL LLC
SEWAGE TREATMENT PLANT SITE
APPENDIX L
STP SITE GENERAL DEPICTION
BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists
FIGURE 1

Consent Decree in the matter of United States and Illinois v. Kerr-McGee Chemical LLC, relating to the Kerr-McGee West Chicago NPL Sites.

APPENDIX M

STP SITE RECORD OF DECISION

Kerr- McGee
Sewage Treatment Plant Site

West Chicago, Illinois

Record of Decision

United States
Environmental Protection Agency

Region 5

September 2004

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	administrative order on consent
ARAR	applicable or relevant and appropriate requirement
BCG	biota concentration guide
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CRP	Community Relations Plan
CSM	conceptual site model
DOE	Department of Energy
DOT	Department of Transportation
EPA	Environmental Protection Agency
EPC	exposure point concentration
FS	feasibility study
GPS	Global Positioning System
HEAST	Health Effects Assessment Summary Tables
IEMA/DNS	Illinois Emergency Management Agency/Division of Nuclear Safety
mL/g	milliliters per gram
NAREL	National Air and Radiation Environmental Laboratory
NCP	National Contingency Plan
NHPA	National Historic Preservation Act
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
OU	operable unit
pCi/g	picoCuries per gram
QAPP	quality assurance project plan
Ra-226	Radium-226
Ra-228	Radium-228
RAO	remedial action objective
RD/RA	remedial design/remedial action
REF	Rare Earths Facility
RESRAD	DOE's RESidual RADioactivity model
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
RME	reasonable maximum exposure
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
STP	Sewage Treatment Plant
TBC	to be considered
UMTRCA	Uranium Mill Tailings Radiation Control Act
USEPA	United States Environmental Protection Agency

GLOSSARY OF TERMS

carcinogen	A substance that causes cancer.
daughter products	The group or chain of nuclides resulting from the radioactive decay of a fundamental precursor or "parent" nuclide.
distribution coefficient	A partition coefficient that compares the amount of an element that is partitioned to the sediment/soil with the concentration dissolved in water.
epidemiological studies	Studies on human populations that attempt to link human health effects (e.g., cancer) to a cause.
half-life	Time for one half the atoms in a mass of an isotope to radioactively decay from one element to a different element.
ionizing radiation	Radioactive emissions (generally alpha particles, beta particles, neutrons, X-rays, or gamma rays) that have sufficient energy to ionize atoms (to remove orbital electrons).
isotope	A variation for an element characterized by a different number of neutrons (or a different atomic mass) from the stable element.
mutagen	A substance or agent that causes an increase in the rate of change in genes (subsections of the DNS of the body's cells).
picoCuries	A rate of radioactive decay equal to one trillionth the decay rate of the fundamental unit, the Curie. One picoCurie represents 2.2 radioactive disintegrations per minute.
rad	*Radiation Absorbed Dose*; a unit of radiation dose representing the amount of energy absorbed per gram of tissue.
radioactive decay	The process whereby an unstable radioisotope emits a particle and releases energy in order to reach a more stable state.
radiotoxicity	Characteristic of radionuclides whereby exposure may be detrimental to human health or the environment.
teratogen	An agent that can cause malformations of an embryo or fetus.

This Record of Decision (ROD) documents the remedy selected for the Kerr-McGee Sewage Treatment Plant Site in West Chicago, DuPage County, Illinois. The ROD is organized in two sections: Part I contains the *Declaration* for the ROD and Part II contains the *Decision Summary*. The *Responsiveness Summary* is included as Appendix A.

PART I: DECLARATION

This section summarizes the information presented in the ROD and includes the authorizing signature of the United States Environmental Protection Agency (USEPA) Region 5 Superfund Division Director.

Site Name and Location

The Kerr-McGee Sewage Treatment Plant Site (CERCLIS # ILD980824031) is comprised of the West Chicago Sewage Treatment Plant and approximately 1.2 miles of river sediments, banks and floodplain soils contaminated with radioactive thorium residuals. The site is located in West Chicago, DuPage County, Illinois, approximately 30 miles west of downtown Chicago.

Statement of Basis and Purpose

This decision document presents the selected remedy for the Kerr-McGee Sewage Treatment Plant Site in West Chicago, DuPage County, Illinois. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). Information used to select the remedy is contained in the Administrative Record file for the site. The Administrative Record file is available for review at the USEPA Region 5 Records Center, 77 West Jackson Boulevard, Chicago, Illinois, and on CD-ROM at the two information repositories: the West Chicago Public Library, 118 West Washington Street, West Chicago, Illinois, and the Warrenville Public Library, 28W751 Stafford Place, Warrenville, Illinois.

Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Description of Selected Remedy

The Sewage Treatment Plant (STP) Site is being addressed as two operable units (OUs): the STP Upland OU (comprised of the West Chicago Sewage Treatment Plant) and the STP River OU (comprised of the West Branch DuPage River from the northern boundary of the STP property to the confluence of the West Branch DuPage River and Kress Creek). Both operable units are addressed in this ROD. The selected remedy specifies response actions that will address radioactively-contaminated sediments and soils at the site. USEPA believes the response actions outlined in this ROD, if properly implemented, will address contaminated sediments and soils and will protect human health and the environment.

The selected remedy for the STP Upland OU is no further action after completion of the ongoing time-critical removal action at that portion of the site. USEPA has determined that the ongoing time-critical removal action is eliminating existing and potential risks to human health and the environment at the STP Upland OU.

The selected remedy for the STP River OU is excavation and off-site disposal of targeted soils and sediments throughout the site. The term "targeted" means materials exceeding 7.2 picoCuries per gram (pCi/g) combined radium, the cleanup standard for the site derived from relevant and appropriate federal and state environmental regulations. The principle threats to human health and the environment are the radioactive materials in sediment and soil. Although the NCP establishes the expectation that USEPA will use treatment to address the principal threats posed by a site whenever practicable, there are no viable treatment alternatives for the radioactive materials at the site. The selected remedy addresses the principle threats by removing the targeted materials from the site and sending them off-site to a permanent, licensed disposal facility.

The major components of the selected remedy for the STP River OU include:

- Removal of approximately 2,200 cubic yards of targeted soils and sediments from the site using mechanical "dry excavation" techniques, with disposal of the targeted materials at a licensed off-site disposal facility. Prior to excavation, targeted areas will be isolated and dewatered to allow excavation in-the-dry. Targeted materials will be excavated to predetermined cut depths based on the available extensive characterization data. In order to remove the targeted materials, approximately 1,100 cubic yards of clean overburden materials also must be excavated and managed;

- Mitigation and restoration activities to restore aquatic and terrestrial areas of the site impacted by the cleanup activities to appropriate, stable conditions, including revegetation of appropriate areas and stabilization of streambanks;

- Monitoring and maintenance of restored areas to assess the effectiveness of stabilization and revegetation measures.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective. The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. It does not satisfy the statutory preference for treatment as a principal element of the remedy because there are no viable treatment alternatives for the radioactive materials at the site.

Because this remedy will not result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a five-year review will not be required for this remedial action.

Data Certification Checklist

The following information is included in the Decision Summary section (Part II) of this ROD. Additional information can be found in the Administrative Record file for this site.

- Contaminants of concern and their respective concentrations (Section 5);
- Baseline risk represented by the contaminants of concern (Section 7);
- Cleanup levels established for contaminants of concern and the basis for these levels (Section 8);
- How source materials constituting principal threats are addressed (Section 11);
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and ROD (Sections 6 and 7);
- Potential land use that will be available at the site as a result of the selected remedy (Section 12);
- Estimated total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 9); and
- Key factors that led to selecting the remedy (Sections 10 and 12).

Support Agency Acceptance

The State of Illinois has indicated a willingness to concur with the selected remedy. The State of Illinois' concurrence letter will be added to the Administrative Record upon receipt.

Authorizing Signatures

9-30-04

Richard C. Karl, Director
Superfund Division
United States Environmental Protection Agency, Region 5

Date

PART II: DECISION SUMMARY

1.0 Site Name, Location and Brief Description

The Kerr-McGee Sewage Treatment Plant Site (CERCLIS # ILD980823991), also known as the STP Site, is located in West Chicago, DuPage County, Illinois, approximately 30 miles west of downtown Chicago. The site is located in the southeastern portion of West Chicago and is comprised of the West Chicago Sewage Treatment Plant and approximately 1.2 miles of river sediments, banks and floodplain soils contaminated with radioactive thorium residuals. Specifically, the site includes the STP property which is owned and operated by the City of West Chicago (located at Illinois Routes 59 and 38, Sarana Drive in West Chicago) and approximately 1.2 miles of the West Branch DuPage River from the northern boundary of the STP property to the confluence of the river and Kress Creek. The site is shown in Figure 1. As shown in Figure 1, the STP, which covers approximately 25 acres and was built in 1919, is located adjacent to the West Branch DuPage River, upstream of the river's confluence with Kress Creek. (Kress Creek and the West Branch DuPage River downstream of the confluence are part of a separate but related site being addressed in a separate Record of Decision.)

The STP Site was placed on the National Priorities List (NPL) in 1990. USEPA began a fund-lead remedial investigation/feasibility study (RI/FS) at the site in 1992, with the State of Illinois (including the Illinois EPA and the Illinois Department of Nuclear Safety) serving as the support agency. Kerr-McGee, a potentially responsible party at the site, officially took over the RI/FS from USEPA in 2003 and completed the RI and FS reports. USEPA conducted the human health and ecological risk assessments. USEPA anticipates that the design and implementation of the remedy selected in this ROD will be carried out by Kerr-McGee under a federal consent decree.

2.0 Site History and Enforcement Activities

2.1 Source of Contamination

The radioactive contamination at the STP Site originated from a nearby facility known as the Rare Earths Facility (REF), which operated from 1932 until 1973. The REF produced non-radioactive elements known as rare earths and radioactive elements such as thorium, radium and uranium, for private entities and the United States government's use in federal atomic energy programs. The REF also manufactured gas lantern mantles. The REF extracted the elements from monazite sands, bastnasite (rare earth ore) and other ores using an acid leaching process, generating radioactive mill tailings as an unwanted byproduct. The mill tailings were stored in large piles at the REF. Kerr-McGee purchased the REF in 1967 and maintained operations at the facility until closing it in 1973. After passage of the Atomic Energy Act the REF was licensed by the Nuclear Regulatory Commission (NRC). In November 1990 the NRC granted licensing authority to the Illinois Department of Nuclear Safety, which is now known as the Illinois Emergency Management Agency/Division of Nuclear Safety (IEMA/DNS). The REF is undergoing cleanup and decommissioning under an IEMA/DNS license.

From approximately 1932 through 1973, the STP received wastes from a variety of sources. Some debris and wastes from the REF were placed at the STP. Radioactive ore, tailings and process wastes from the REF were used at the STP as fill, to contour grounds, and were mixed with landfill wastes, resulting in soil contamination at the site. These materials also were used as fill along approximately 320 feet of riverbank, and some of the contamination then entered the river due to erosion and surface water runoff. Thorium residuals then were distributed over time in areas of the river including some areas of sediments, streambanks and floodplains.

Three other related Kerr-McGee NPL sites were placed on the NPL in 1990 or 1991: the Reed-Keppler Park Site, the Residential Areas Site, and the Kress Creek/West Branch DuPage River Site. The contamination at those three sites also originated at the REF, and those sites are being or have been addressed by separate actions.

2.2 Previous Investigations and Cleanups

Prior to the site's listing on the NPL, the NRC conducted studies from 1976 to 1978 to determine if any areas outside the boundaries of the REF had been contaminated by thorium residuals from the REF. The investigations, including an aerial radiological flyover survey and ground-level investigations, included the Sewage Treatment Plant and other locations in and around the West Chicago area.

Radiological surveys were performed at the STP in 1983 and 1984, including a borehole logging program to determine the extent of subsurface thorium materials and to estimate volumes and locations of thorium materials. These surveys were conducted as part of a cleanup effort at the STP by Kerr-McGee pursuant to a 1985 consent decree entered into by the City of West Chicago and Kerr-McGee. Under that consent decree, Kerr-McGee removed an estimated 57,000 cubic yards of material from the STP during 1986 and 1987 and transported the material to the REF. Under the cleanup effort, materials exceeding an exposure rate of 30 microRoentgen per hour measured at one meter above the surface were excavated. Material exceeding this exposure rate was left behind in two areas located under or next to outfalls along the bank of the river because removal of the material would have required replacement of the outfalls.

A second aerial radiological flyover survey of areas in and around West Chicago was performed in 1989 for the Illinois Department of Nuclear Safety. The flyover showed areas of elevated radioactivity at the STP property and along areas of the river between the STP and the river's confluence with Kress Creek.

After USEPA listed the site on the NPL, both USEPA and Kerr-McGee conducted studies at the site. Those studies are discussed in detail in Section 5 of this ROD. Based on those studies and as an outgrowth of negotiations between Kerr-McGee and other parties (discussed further in Section 2.3 of this ROD), Kerr-McGee agreed to conduct a time-critical removal action at the STP property. USEPA therefore divided the STP Site into two operable units: an upland OU consisting of the STP property and a river OU consisting of the rest of the site. Kerr-McGee and

USEPA signed an administrative order on consent (AOC), effective October 16, 2003, for Kerr-McGee to conduct a time-critical removal action at the STP Upland OU.

Under the removal action, Kerr-McGee is excavating radiologically-contaminated soils from the site and transporting them off-site for disposal. The cleanup standard for the removal action, 7.2 pCi/g, is derived from relevant and appropriate federal and state regulations and is the same cleanup standard used at the Kerr-McGee Residential Areas and Reed-Keppler Park Sites. Based on the extensive site characterization data available from the USEPA and Kerr-McGee studies at the site (discussed in Section 5 of this ROD), the lateral and vertical extent of the contamination at the site is very well-defined. Under the removal action, Kerr-McGee must excavate to predetermined cut depths, with the cut depths designed to achieve the 7.2 pCi/g cleanup standard. The excavations are then verified to ensure the proper depths and locations have been achieved. The removal action, including the verification of excavation depths and locations, is being overseen by USEPA and IEMA/DNS.

The time-critical removal action at the STP Upland OU began in late October 2003. The site was divided into several different excavation areas for removal planning and management purposes, and most of the excavation areas then were further divided into sub-areas. Figure 2 is a sketch which shows the excavation areas (and sub-areas) at the Upland STP OU. The excavation areas are described below, along with other information relevant to the removal action:

- Area 1 is located along the STP's 48-inch discharge pipe. Excavation work started on November 4, 2003, was completed on November 17, 2003, and included removal and replacement of the 48-inch pipe and its associated headwall. Restoration activities were completed in May 2004. Approximately 171 cubic yards of contaminated material were removed from this area.

- Area 2 is located near the river at the northeast corner of the STP property. Excavation work started on November 4, 2003, and was completed on December 5, 2003. Restoration activities were completed in May 2004. Approximately 570 cubic yards of contaminated material were removed from this area.

- Area 3 is located south of the STP's four large, rectangular tanks. Excavation work started on October 23, 2003, and was completed on November 20, 2003. Restoration activities were completed in May 2004. Approximately 580 cubic yards of contaminated material were removed from this area.

- Area 4 is located south of Area 3 and includes areas both north and south of Area 1. Excavation work started on November 4, 2003, and was completed on April 22, 2004. Restoration activities were completed in May 2004. Approximately 1,246 cubic yards of contaminated material were removed from this area.

- Area 5 is the southernmost excavation area and includes the old 24-inch outfall pipe. Excavation work started on December 1, 2003, and is not yet complete. The work that has been completed included removal and replacement of the old 24-inch pipe and its associated headwall. The work in Area 5 is not yet complete because the westernmost portion of this area, known as Area 5D, contains a number of underground utilities that must be relocated by the electric company (ComEd) before the contaminated materials can be removed. The removal work in Area 5D had to be postponed to allow ComEd time to redesign and implement the electrical utility relocation in that section. As of the writing of this ROD, approximately 3,714 cubic yards of contaminated material had been removed from Area 5. An estimated 170 cubic yards of contaminated material remain to be removed from Area 5D.

In summary, a total of 6,281 cubic yards of contaminated materials have been removed from the STP Upland OU to date, and only an estimated 170 cubic yards remain to be removed from Area 5D. After the electrical utilities are relocated in that area, Kerr-McGee will complete the removal action at the STP Upland OU and will submit a final removal action report to USEPA for review and approval.

2.3 Enforcement Activities

After the site was listed on the NPL in August 1990, USEPA issued a letter on September 6, 1991, notifying Kerr-McGee that USEPA had decided not to use the special notice and negotiation procedures regarding the conduct of an RI/FS and that USEPA would conduct the RI/FS at the site. USEPA began a fund-lead RI/FS at the site in May 1992.

In 1998, as a result of discussions regarding the Kerr-McGee Reed-Keppler Park Site (a related but separate NPL site), Kerr-McGee and the City of West Chicago jointly requested that USEPA put its RI/FS work at the STP Site (and the Kress Creek Site) on hold to give those parties time to negotiate separately regarding the cleanup of the creek, river and STP. During the negotiations, additional local governmental entities became involved and the group negotiating with Kerr-McGee became known as the "local communities." The local communities included the City of West Chicago, the West Chicago Park District, DuPage County, the DuPage County Forest Preserve District and the City of Warrenville. As part of the negotiations, Kerr-McGee conducted extensive characterization activities at the STP Site.

In February 2002, Kerr-McGee and the local communities presented to USEPA the conceptual agreement they had reached regarding cleanup of the river and creek (including the river portion of the STP Site). USEPA, Kerr-McGee and other parties then engaged in subsequent discussions regarding the cleanup proposal and on October 10, 2003, the U.S. Government and Kerr-McGee signed a non-binding Agreement in Principle. The Agreement in Principle set the stage for Kerr-McGee's takeover and completion of the RI/FS, for Kerr-McGee's conduct of a removal action at the upland portion of the STP site, and for detailed negotiations on a consent decree for remedial design/remedial action (RD/RA) at the river portion of the STP site. U.S. EPA signed an Action Memorandum on October 7, 2003, for a time-critical removal action at the upland portion of the STP Site. As anticipated by the Agreement in Principle, USEPA and Kerr-McGee signed an AOC, effective October 16, 2003, for Kerr-McGee to conduct a time-critical removal action at the upland portion of the STP Site. Also as anticipated by the Agreement in Principle, USEPA and Kerr-McGee signed an AOC, effective November 21, 2003, for Kerr-McGee to complete the RI/FS. Kerr-McGee completed the RI and FS reports and USEPA completed the human health and ecological risk assessment reports, and USEPA approved all of the documents in May 2004. All of the documents mentioned above are included in the Administrative Record for the Site.

After issuing the proposed plan for the STP Site, USEPA issued a letter on June 30, 2004, notifying Kerr-McGee that USEPA did not intend to issue a special notice letter establishing a negotiation moratorium for the RD/RA negotiations. USEPA made this decision based on the fact that the parties had so far proceeded according to the October 2003 Agreement in Principle and had already exchanged several drafts of an RD/RA consent decree for the site.

3.0 Community Participation

The Proposed Plan for the STP Site was made available to the public for comment on May 24, 2004. On that day, copies of the Proposed Plan and the final RI, FS and risk assessment reports (as well as other supporting documents) were placed in the local Information Repositories located at the West Chicago Public Library and the Warrenville Public Library, and copies of the Proposed Plan were mailed to all interested persons on USEPA's community involvement mailing list for the site. Copies of the Proposed Plan also were mailed to all members of the West Chicago Intergovernmental Forum, and copies of the final RI, FS and risk assessment reports were provided to forum members who requested copies. The Intergovernmental Forum is a group comprised of persons representing city, county, state and federal government entities (including local, state and federal elected officials), the Thorium Action Group (a local community activist group), and Kerr-McGee.

Copies of all documents supporting the remedy outlined in the Proposed Plan are located in the Administrative Record file for the site, located at the USEPA Records Center, 77 West Jackson Boulevard, Chicago, Illinois. The Administrative Record file was available for review as of May 24, 2004. In addition, copies of all the documents in the Administrative Record file were put on CD-ROM and mailed to the local Information Repositories on June 22, 2004.

The 30-day public comment period ran from May 26, 2004, to June 25, 2004. USEPA held a public meeting at the Warrenville City Hall on June 2, 2004, to present the Proposed Plan and approximately 120 people attended. (The meeting also dealt with the Proposed Plan for the Kress Creek Site.) The notice announcing the public meeting and the availability of the Proposed Plan was published in the ***Daily Herald*** on May 25 and June 1, 2004, and in the ***Liberty Suburban Press/Post*** on May 27, 2004. Representatives of USEPA, the Illinois EPA and IEMA/DNS were present at the public meeting, as were representatives of Kerr-McGee and the local communities, to answer questions regarding the proposed remedy. Responses to comments received during the public comment period (including comments received at the public meeting) are included in the Responsiveness Summary which is Appendix A of this ROD.

In addition to the public involvement activities noted above, USEPA mailed out a fact sheet and held a public meeting at the start of the RI fieldwork in February/March 1993. USEPA mailed out another fact sheet and held another public meeting in September 1994 to discuss the second phase of the site investigation. USEPA also developed a Community Relations Plan (CRP) for all four Kerr-McGee NPL sites when it began RI/FS activities at the sites in 1992/1993, and the CRP was finalized in 1994. In order to conduct the field sampling activities at the site, particularly along the river portion of the site, USEPA had to obtain access from the individual property owners along the river, and USEPA has had discussions about site activities with several of those property owners over the years.

Another form of community participation is the West Chicago Intergovernmental Forum, which formed around 1992/1993. The Forum, which meets regularly (monthly or bimonthly), includes representatives of USEPA, the two State support agencies (Illinois EPA and IEMA/DNS), representatives of the local communities (City of West Chicago, City of Warrenville, DuPage County, DuPage County Forest Preserve District and West Chicago Park District), the Thorium Action Group, Kerr-McGee, and other state and local representatives. USEPA, a principal participant in the Forum, provides regular updates on project status, and other parties raise any issues of concern to them. Those parties then report back to their larger constituencies. The Forum meetings have proven to be an effective two-way communication tool between USEPA and representatives of various stakeholder groups. USEPA also engaged Forum members in a dialogue regarding future land uses and, as a result, obtained input from the local communities on their future plans for the land in and around the site.

Lastly, the local communities (as defined above), and particularly the City of West Chicago, have been extensively involved in the STP Site. In 1998, the City and Kerr-McGee asked USEPA for time to negotiate separately. USEPA gave those parties time to negotiate, and as a result the City and other local community entities were directly involved in the site investigation process. As part of the negotiation process with the local communities, Kerr-McGee conducted intensive radiological gamma scans and approximately 2,400 delineation drilling locations, including approximately 780 locations on the STP property and more than 1,600 locations in the river between the STP and the river's confluence with Kress Creek. The local communities and Kerr-McGee ultimately reached a conceptual agreement for cleanup of the site and presented that proposal to USEPA in February 2002.

4.0 Scope and Role of Response Action

This ROD is the first, and is intended to be the final, ROD for the STP Site. The STP Site is being addressed in two operable units under the framework set forth in CERCLA.

The first OU, the STP Upland OU (consisting of the upland portion of the STP Site), is being addressed by a time-critical removal action being conducted by Kerr-McGee pursuant to an October 2003 AOC. This ROD calls for no further action at the STP Upland OU after completion of that removal action. The second OU, the STP River OU, is addressed entirely by this ROD. Therefore, the selected remedy specified in this ROD will serve as the final action for the entire site.

5.0 Site Characteristics

5.1 Conceptual Site Model

The conceptual site model (CSM) provides an understanding of the site based on the sources of the contaminants of concern, potential transport pathways and environmental receptors.

Based on the nature and extent of the contamination and the fate and transport mechanisms described in the RI Report, the CSM for the STP Site includes the following components:

- the contaminants of concern are thorium residuals (primarily fine particles and tailings) from the historic processing of thorium-containing monazite ores at the REF, including primarily radionuclides in the thorium decay chain and, to a lesser extent, radionuclides in the uranium decay chain and elemental metals associated with the thorium-containing ores;

- the highest soil radioactivity levels were found on the STP property, with radioactivity levels in the river generally decreasing in the downstream direction;

- the higher radioactivity levels in the floodplain soils were predominantly found in floodplain areas closest to the waterway as compared to further from the waterway;

- the radiological contaminants are distributed in the environment along with other fine-grained materials;

- the presence of a clean overburden[1] layer on top of some areas of contaminated soils and sediments indicates the ongoing burial of radiological contaminants; and

- the primary contaminant transport mechanism is solids transport via surface water, with subsequent downstream deposition either in quiescent areas of the river or in overbank floodplain areas during high flow events.

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[1] Overburden is material overlying other materials; in this case, clean materials that have been deposited upon and covered the contaminated materials.

For risk assessment purposes, the conceptual site models used to illustrate contaminant distribution, release mechanisms, potential exposure pathways and migration routes, and potentially-exposed populations, are depicted in Figures 3 through 8. (Figures 3 and 4 show the conceptual site models used in the human health risk assessment for the STP Upland OU and the STP River OU, respectively. Figures 5 and 6 show the conceptual site models used in the ecological risk assessment for the STP Upland OU for radionuclides and other chemical contaminants, respectively. Figures 7 and 8 show the conceptual site models used in the ecological risk assessment for the STP River OU for radionuclides and other chemical contaminants, respectively.)

5.2 Site Overview

The STP Site is located approximately 30 miles west of downtown Chicago in suburban DuPage County, Illinois, one of the fastest growing segments of the greater metropolitan Chicago area. As described in Section 4 of this ROD, the site is broken into two OUs: the STP Upland OU and the STP River OU. The STP Site is shown in Figure 1.

The STP Upland OU consists of the 25-acre STP property which is owned and operated by the City of West Chicago and is located at Illinois Routes 59 and 38, Sarana Drive in West Chicago. The STP property includes an operating sewage treatment plant which was built in 1919 and serves the West Chicago regional area. The STP property is located immediately adjacent to the West Branch DuPage River, approximately 1.2 miles upstream of the confluence of the river with Kress Creek. The STP property is located in an area of low-density development, with residential areas to the west, scattered residences to the east and south, and the West DuPage Woods Forest Preserve to the north.

The STP River OU consists of approximately 1.2 miles of the West Branch DuPage River from the northern boundary of the STP property to the confluence of the creek and river and includes areas of the river banks adjacent to the STP property that are not part of the STP Upland OU. Land use along the West Branch DuPage River between the northern boundary of the STP property to the confluence with Kress Creek is predominantly recreational along both banks, although the western bank near the STP property is owned by the City of West Chicago. There are some homes and a church on the eastern side of the river between the STP and Gary's Mill Road, but only limited development exists from Gary's Mill Road to the confluence, as the river flows through the Roy C. Blackwell Forest Preserve.

The West Branch DuPage River is approximately 40 to 50 feet wide and 2 to 5 feet deep, and generally has gravel banks and a stream bed that is stony and covered with vegetation. Monthly average flows range from about 63 cubic feet per second (cfs) in October to about 184 cfs in April, with a yearly average of approximately 107 cfs. The West Branch DuPage River is one of two branches of the DuPage River. The DuPage River is part of the 1,386 square mile Des Plaines River Drainage Basin. The Des Plaines River flows to the Illinois River which in turn empties into the Mississippi River.

As illustrated by the recorded stream flow values cited above, the flows in the river vary seasonally, with higher flows typically occurring in the spring from March until May or June, lower flows occurring in summer from July to October, and moderate flows occurring during the winter from November to February. Average flow in the river can vary by an order of magnitude (i.e., a factor of ten) from year to year, and flows between drought and flood conditions can be expected to vary by several orders of magnitude. Flooding of the river is common, and heavy rains can cause the river to overflow its banks.

DuPage County lies within the Great Lakes and Till Plain section of the Central Lowlands physiographic province which consists of glaciated lowlands. Elevations near the site range from 710 feet above mean sea level at the STP property to 700 feet near the river's confluence with Kress Creek. The topography of the river generally slopes from north to south with an average gradient of 3.7 feet per mile. The generalized site geology consists of the following, starting at ground surface: alluvial deposits (where present along the stream channel and floodplain); discontinuous clayey glacial till; sandy, silty, and/or gravelly outwash materials; clayey glacial till; and dolomite bedrock.

Wetlands are present along the river and have been identified and described in studies using the Cowardin classification system and the criteria in the 1987 *Wetlands Delineation Manual*. The wetland studies summarized in the RI Report identified 11 wetlands along the STP Site totaling 18 acres. The majority of the wetlands exhibited palustrine deciduous forest characteristics. Much of the wetland areas have been overgrown with invasive weeds such as garlic mustard, buckthorn and reed canary grass. None of the wetland studies performed to date have identified any "high quality" wetlands at the site.

5.3 Sampling Strategy

Both USEPA and Kerr-McGee conducted investigation work at the site as part of the remedial investigation. As part of its fund-lead RI/FS work, USEPA conducted sampling at the site in 1993 and 1994. Kerr-McGee later conducted additional, extensive site investigations beginning in 1997 as a result of its negotiations with the local communities.

USEPA's 1993 investigations focused on the upland portion of the site and included radiological walkover surveys, soil borings, down-hole gamma logging and soil sampling for radionuclides and other chemicals. Because the STP property had received waste from a variety of sources prior to Kerr-McGee's removal activities in the mid-1980s, USEPA installed four monitoring wells at the site (one upgradient and three downgradient) and sampled groundwater for radionuclides and other chemicals. Based on the fact that Kerr-McGee had removed an estimated 57,000 cubic yards of radioactively-contaminated materials from the upland portion of the site in 1986 and 1987, the intent of USEPA's investigation was to evaluate the adequacy of that cleanup effort.

In 1994 USEPA extended its investigation to the river portion of the site and conducted radiological walkover surveys of bank and floodplain areas along the river, and sampling of soil, sediment, surface water and fish for radionuclides and other chemicals. USEPA also conducted terrestrial and aquatic community surveys at the site and collected additional groundwater samples from the upland portion of the site. Isotopic analysis of all of USEPA's radiological samples collected in 1993 and 1994 was conducted by USEPA's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama.

Beginning in 1997 and continuing into 2004, Kerr-McGee conducted extensive, voluntary radiological characterization work at the site. Kerr-McGee's sampling strategy, developed as an outgrowth of its negotiations with the local communities, was to fully characterize the site and collect enough data to support detailed design efforts for site cleanup.

Kerr-McGee's testing of the river portion of the site included radiological surface gamma scans of essentially 100% of the sediments, banks and affected floodplains. If gamma readings indicated materials exceeding 7.2 pCi/g (see footnote[2]) combined radium (the cleanup standard used by USEPA at both the Residential Areas Site and the Reed-Keppler Park Site), then Kerr-McGee conducted delineation drilling and down-hole gamma logging at those locations, with "step-out" locations conducted as needed to find the clean edges of contaminated areas. At each delineation drilling location, gamma readings were collected from each 6-inch depth interval until a minimum depth of 36 inches (3 feet) below ground surface was reached. This depth was extended, if necessary, to achieve a minimum of two consecutive readings below the 7.2 pCi/g criterion.

For the upland portion of the site, Kerr-McGee focused on areas of the site that USEPA's investigation showed required further investigation. Kerr-McGee conducted delineation drilling and down-hole gamma logging at those locations, with "step-out" locations conducted as needed to find the clean edges of contaminated areas, similar to the procedure described above for the river portion of the site. The only difference was that the minimum drilling depth for the initial locations was not three feet but was as deep as necessary based on the information from the USEPA investigation.

The extensive down-hole gamma logging data collected by Kerr-McGee provides information on both the vertical and areal extent of contamination. Between 1997 and 2004, Kerr-McGee's voluntary characterization efforts included approximately 2,400 borings at the STP Site to characterize the extent of radioactive contamination, including approximately 780 test holes at the STP and more than 1,600 in the river between the STP and the confluence. Kerr-McGee collected a limited number of soil and sediment samples for isotopic laboratory analysis, but the vast majority of the Kerr-McGee data consisted of field-collected gamma data.

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[2] More details of how the 7.2 pCi/g cleanup standard was derived are provided in Sections 8.1 and 8.2 of this ROD.

Although Kerr-McGee did not submit to USEPA for approval a work plan and quality assurance project plan (QAPP) prior to conducting the voluntary characterization efforts, Kerr-McGee had prepared such internal documents and followed them during the voluntary characterization effort. (Kerr-McGee already had experience dealing with USEPA on such matters, having already prepared similar documents for USEPA approval for both the Residential Areas Site and the Reed-Keppler Park Site cleanups.) After Kerr-McGee and the local communities presented their conceptual cleanup proposal to USEPA, and as a result of subsequent discussions between all the parties, Kerr-McGee formally submitted to USEPA for approval its *"Investigation Work Plan for the Kress Creek/West Branch DuPage River Site"* which, despite its title, also covered the STP Site. The document, which included an Investigation Work Plan, a QAPP, a Health and Safety Plan and an Emergency Contingency Plan, was used by Kerr-McGee for all the prior characterization work and would be used by Kerr-McGee for any continuing/future characterization work at the site. The document included many of the Standard Operating Procedures that already had been approved by USEPA for use at the Reed-Keppler Park Site and/or Residential Areas Site. USEPA determined that the document conformed to USEPA guidance regarding sampling, quality assurance/quality control, data validation and chain-of-custody procedures, and USEPA approved the document (for all past and future characterization work at the site) on August 26, 2003. USEPA considers Kerr-McGee's data acceptable for use for both remedy selection and design purposes.

In addition to the radiological testing, Kerr-McGee also conducted wetlands delineation studies, a tree survey (for negotiations with the local communities), and terrestrial and aquatic community surveys.

For purposes of the risk assessment, USEPA chose to use only that radiological data based on laboratory isotopic analysis of samples, which provides specific results for individual radionuclides. Kerr-McGee's extensive surface gamma scan and down-hole gamma logging data represent field screening level analysis; such gamma data was relied upon heavily in determining the extent of contamination at the site, but was not used for input in the radiological risk assessment process because of the lack of isotopic analysis. Although the isotopic data was a smaller data set, the range of values used for risk assessment purposes was consistent with the larger gamma data set and was sufficient to demonstrate risk at the site. Site risks are discussed in Section 7 of this ROD.

5.4 Source of Contamination

As discussed in Section 2.1 of this ROD, the radiological contaminants at the STP Site originated at the REF and were transported to the STP property for use as fill material, including areas along the riverbank. The radioactively-contaminated soils at the STP property then served as the source of contamination for the river portion of the site, as some of the contamination on the STP property entered the river due to erosion and solids transport during surface water runoff. The radiological contaminants then were distributed over time in areas of the river including some areas of sediments, riverbanks and floodplains.

It is possible that other contaminants arrived at the site from other locations because the STP received wastes from a variety of sources from 1932 through 1973. Landfilled areas of the STP property then were excavated during the Kerr-McGee cleanup effort in 1986 and 1987. Additionally, other non-site-related contaminants could have entered the river due to runoff from highways and/or other non-point sources in the watershed.

The REF is undergoing cleanup and decommissioning under an IEMA/DNS license and is no longer a source of contamination to the STP Site.

5.5 Types of Contaminants and Affected Media

The contaminants of concern at the STP Site are radionuclides in the thorium decay chain and, to a lesser extent, the uranium decay chain. The thorium and uranium decay chains are depicted in Figures 9 and 10, respectively. Elemental metals associated with the monazite ores and thorium tailings from the REF, such as arsenic and lead, also were contaminants of potential concern. The medium of concern at the STP Upland OU is soil. The media of concern at the STP River OU are river sediments and banks and floodplain soils.

Although metals such as arsenic and lead were detected in some samples at the site, they do not drive risks at the site. The fact that the areas of elevated metals are co-located with thorium materials means that any remedial measures that address the radiological contamination also will address any areas of elevated metals.

In addition to the contaminants discussed above, other chemicals were detected in some of the samples collected at the site and were carried forward in the risk assessment as potential contaminants of concern. For example, iron and benzo(a)pyrene were detected in soils at the STP Upland OU and in soils/sediments at the STP River OU. These (and other) chemical contaminants were evaluated in the risk assessment, and although they were carried through the risk assessment process as contaminants of potential concern, none of them drive the need for cleanup at the site.

The radiological contaminants of concern – thorium and uranium decay chain materials – are in secular equilibrium at the site, meaning that the concentration of the various radionuclides within a decay chain is the same. Due to the higher radiotoxicity of radium-228 (Ra-228) and radium-226 (Ra-226), which are daughter products of thorium-232 and uranium-238, respectively, those two radium isotopes are representative of the contaminants of concern. This section of the ROD, therefore, focuses primarily on their characteristics. Ra-226 and Ra-228 have limited interaction characteristics (i.e., they do not volatilize or oxidize) and do not undergo biodegradation, so this section addresses only their relevant characteristics.

5.5.1 Physiochemical Properties

A constituent with a high distribution coefficient will partition preferentially to soil or sediment. Ra-226 and Ra-228 have distribution coefficients of 250 milliliters per gram (mL/g) and are considered very immobile in soil/sediment.

5.5.2 Constituent Transformation

All radionuclides undergo transformation through radioactive decay. The radiological contamination at the site is predominantly thorium-232, which has a half-life of about 14 billion years (see Figure 9). The half-life of uranium-238, the parent of the other decay chain, is 4.5 billion years (see Figure 10). Although the half-lives of their radium daughters are significantly shorter (5.7 years for Ra-228 and 1,600 years for Ra-226), the radium daughters are being constantly replenished by the long-lived parent radionuclides. As a result, radium concentrations at the site will not decrease appreciably for billions of years if left in place.

5.5.3 Constituent Persistence

Due to the factors described above, the radiological contaminants at the site will persist in soil and sediment for billions of years if left in place.

5.5.4 Toxicity Assessment

USEPA classifies all radionuclides as known human carcinogens, based on their property of emitting ionizing radiation and on the extensive weight of evidence provided by epidemiological studies of radiogenic cancers in humans. Ionizing radiation has been shown to be a carcinogen, a mutagen, and a teratogen. Evaluation of the health risks of radionuclides typically consider only the carcinogenic effects, because, in most cases, cancer risks are limiting, exceeding both mutagenic and teratogenic risks. However, some radionuclides also can exhibit chemical toxicity. Uranium, for example, can be associated with noncarcinogenic toxic effects such as kidney damage.

5.6 Extent of Contamination

This section presents a summary of the results associated with the RI conducted at the site. A full description of the RI activities and sampling results is contained in the May 2004 *Remedial Investigation Report* which is included in the Administrative Record for the Site.

As mentioned in Section 5.3 above, both USEPA and Kerr-McGee conducted characterization efforts at the site. Tables 1 through 3 contain a summary of the total radium, thorium and uranium concentrations, respectively, by matrix and reach[3], based on USEPA's 1993 and 1994 sampling efforts. Because these data were based on laboratory isotopic analysis of samples, they (along with a limited amount of isotopic data collected by Kerr-McGee) were used in the risk assessment for the site. For the STP Upland OU, USEPA's sampling (and downhole gamma logging) guided Kerr-McGee's later extensive characterization efforts. For the STP River OU, USEPA's sampling was limited in scope and included only shallow soil and sediment samples. For both portions of the site, Kerr-McGee's later extensive surface scan and downhole gamma data provide a much more thorough picture of the lateral and vertical extent of contamination at the site.

Based on USEPA's data, the highest concentration of total radium in soils at the STP Upland OU was 58.1 pCi/g. For the STP River OU, the highest concentration of total radium in soils was 445.9 pCi/g and the highest concentration in sediments was 14.2 pCi/g.

Kerr-McGee's characterization efforts at the STP River OU included radiological surface gamma scans of essentially 100% of the sediments, banks and affected floodplains. As described earlier in Section 5.3 of this ROD, if the surface gamma readings indicated materials exceeding 7.2 pCi/g, Kerr-McGee conducted delineation drilling and down-hole gamma logging at those locations, with "step-out" locations conducted as needed to delineate the horizontal and vertical extent of contamination. At each delineation drilling location, gamma readings were collected from each 6-inch depth interval until a minimum depth of 36 inches (3 feet) was reached. This depth was extended, if necessary, to achieve a minimum of two consecutive readings below the 7.2 pCi/g criterion.

At the STP Upland OU, Kerr-McGee conducted delineation drilling and down-hole gamma logging at certain locations based on USEPA's data, with "step-out" locations conducted as needed to find the clean edges of contaminated areas, similar to the procedure described above for the river portion of the site. The only difference was that the minimum drilling depth for the initial locations was not three feet but was as deep as necessary based on the information from the USEPA investigation.

Figure 11 shows the locations and results of Kerr-McGee's delineation drilling effort for the site. Delineation drilling locations that had any reading in the test hole exceeding 7.2 pCi/g are shown as orange dots, while locations with no readings exceeding 7.2 pCi/g are shown as black dots. Contiguous areas exceeding 7.2 pCi/g at the STP River OU are shaded in yellow. Contiguous areas exceeding 7.2 pCi/g at the STP Upland OU are not shaded yellow on Figure 11 because those areas are being addressed by the ongoing time-critical removal action at that portion of the site. (Note that Figure 11 also includes some information for the Kerr-McGee Kress Creek Site because both the Kress Creek and Sewage Treatment Plant Sites were addressed in the same RI

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[3] In Tables 1 through 3, the reach entitled "West Branch DuPage River Background" refers to a location upstream of the STP property and "West Branch DuPage River Upstream" refers to the river portion of the STP site (upstream of the confluence).

and FS reports. The Kress Creek Site will be addressed in a separate ROD. Kress Creek is not labeled on Figure 11 but is labeled on Figure 1. Kress Creek is the stream that joins with the West Branch DuPage River near the bottom of the both Figures 1 and 11. The Kress Creek Site includes not only the creek but the river south of the confluence. The southern boundary of the STP Site is the river's confluence with the creek.)

As shown by Figure 11, materials with total radium concentrations greater than 7.2 pCi/g are located primarily on the upland portion of the STP Site and on the river banks at the eastern edge of the STP property. Areas exceeding 7.2 pCi/g in the other areas of the river between the STP property and the river's confluence with Kress Creek (near the bottom of the figure) are generally limited to isolated pockets in the floodplain. Note that the areas of contamination at the Kress Creek Site that also are shown on Figure 11 (including the areas in Kress Creek and in the river south of the confluence) are not addressed by this ROD but will be addressed in a separate ROD for the Kress Creek Site.

Figure 11 includes a dashed black line on the STP property depicting the boundary between the STP Upland OU and the STP River OU. Areas located west of the dashed black line are part of the STP Upland OU and are being addressed by the ongoing time-critical removal action pursuant to the October 2003 AOC. Areas along the eastern edge of the STP property, as well as all remaining areas of the river downstream to the confluence with Kress Creek, are part of the STP River OU. Kerr-McGee's data from these two areas of the site are discussed in more detail below.

STP Upland OU

Kerr-McGee conducted delineation drilling and down-hole gamma logging at approximately 780 locations on the STP property. The drilling locations and the horizontal extent of contaminated soils are shown in Figure 11. The data from these locations define the vertical and spatial distribution of the radiological contamination at the site and are being used during the ongoing time-critical removal action to define the extent of removal required at the STP Upland OU. Based on the data from the approximately 780 test holes, the layer of materials with total radium greater than 7.2 pCi/g averages 1.2 feet in thickness, and the average thickness of overburden covering these soils is approximately 4.7 feet. Only six surface samples exhibited total radium at a level greater than 7.2 pCi/g (with a maximum of 11 pCi/g). For the 364 test holes with total radium levels (at any depth) greater than 7.2 pCi/g, the average was 18 pCi/g and the maximum was 1,386 pCi/g.

STP River OU

Summary statistics from Kerr-McGee's delineation drilling efforts at the STP River OU are provided in the table below. The table shows the number of borings for the river where a measurement greater than 7.2 pCi/g was obtained in the 0- to 6-inch depth interval and the number of borings where any depth interval had readings greater than 7.2 pCi/g. The average and maximum radioactivity levels for these locations are provided.

Reach	Borings with Measurement > 7.2 pCi/g	Average (pCi/g)	Maximum (pCi/g)
0- to 6-inch Depth Interval			
West Branch DuPage River Upstream of Confluence	160	15.0	380
All Depth Intervals			
West Branch DuPage River Upstream of Confluence	489	20.8	588

For the 0- to 6-inch depth interval, the average radioactivity was 15.0 pCi/g and the maximum was 380 pCi/g. The maximum reading was measured near the STP and the radioactivity levels generally decrease in the downstream direction.

Considering radiological measurements from all depths, the average radioactivity was 20.8 pCi/g and the maximum was 588 pCi/g. As with the surface readings discussed above, the maximum reading at any depth was measured near the STP and the radioactivity levels generally decrease in the downstream direction.

To enable a general evaluation of the vertical extent of the radioactivity, summary statistics from Kerr-McGee's delineation drilling effort in the river are provided in the table below. This table shows the total number of borings installed, the number of borings with measurements greater than 7.2 pCi/g, the average depth of overburden material on top of contaminated soils/sediments, and the average depth below the surface to which the materials exceeding 7.2 pCi/g extended. The average thickness of the contaminated layer also is provided.

Reach	Borings	Borings with Measurement > 7.2 pCi/g	Average Depth of Overburden covering Contaminated Layer (feet)	Average Depth of Base of Contaminated Layer (feet)	Average Thickness of Contaminated Layer (feet)
West Branch DuPage River Upstream of Confluence	1,611	489	1.2	2.3	1.1

As shown in the table above, the average thickness of the layer of contaminated materials in the river is 1.1 feet and the average thickness of the overburden layer is 1.2 feet.

Overall Site

The total volume of identified material above 7.2 pCi/g at the STP Site is estimated to be approximately 8,650 cubic yards. Approximately 6,450 cubic yards of that total represent contaminated soils at the STP Upland OU that are being addressed by the ongoing time-critical removal action, with all but 170 cubic yards already removed (as discussed in Section 2.2 of this ROD). The remaining 2,200 cubic yards represent contaminated soils and sediments at the STP River OU.

6.0 Current and Potential Future Land and Resource Uses

Current land use at the STP Upland OU is industrial, as the property is home to an operating sewage treatment plant. Currently exposed populations potentially include maintenance workers (who perform general maintenance work around the STP facility, including some limited intrusive work in subsurface soil) and construction workers (who perform intermittent construction work, including work in subsurface soil). Future land use is expected to remain the same, but portions of the property could potentially become residential.

Current land use along the STP River OU includes residential areas, county forest preserves, and property owned by religious organizations. Future land use is anticipated to remain the same (i.e., mixture of residential and recreational use).

River surface water is used for recreational purposes (e.g., canoeing when water levels are high enough, recreational fishing) but the water is not used as a drinking water source and is not expected to be used as a drinking water source in the future. Ground water at the STP Upland OU is not used as a drinking water source and is not expected to be used as a drinking water source in the future. The City of West Chicago has an ordinance prohibiting private well use for potable water within the city limits. All properties within the city limits are connected to the city's public water supply, which draws its water from nine public supply wells in the West Chicago area.

7.0 Summary of Site Risks

USEPA prepared a baseline human health risk assessment and a screening-level ecological risk assessment for the STP Site to evaluate potential risks to human health and the environment if no action were taken. The risk assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline human health risk assessment and the screening-level ecological risk assessment for the site.

The risk assessments evaluated the risks from both radiological and non-radiological contaminants at the site in various media. In accordance with USEPA guidance on preparing RODs, the information presented here focuses on the information that is driving the need for the response action at the site and does not necessarily summarize the entire baseline human health or ecological risk assessment. Further information is contained in the risk assessment documents, entitled *Final Human Health Risk Assessment* (May 2004) and *Final Ecological Risk Assessment* (May 2004); both documents are included in the Administrative Record for the site.

For purposes of the radiological portions of the risk assessments, USEPA chose to use only that radiological data based on laboratory isotopic analysis of samples, which provides specific results for individual radionuclides. Kerr-McGee's surface gamma scan and down-hole gamma logging data do not include isotopic analysis and therefore were not used in the risk assessments. Although the isotopic data represented a smaller data set, the range of values used for risk assessment purposes was generally consistent with the larger gamma data set and was sufficient to fulfill the objectives of the risk assessment (i.e., to evaluate baseline risks and to provide the basis for taking action at the site).

7.1 Summary of Human Health Risk Assessment

The human health risk assessment evaluated the potential risks that could result to people from exposure to the contaminants at the site. The risk assessment evaluated the risks associated with a reasonable maximum exposure (RME) scenario. Based on the current and anticipated future land use at the site, USEPA evaluated the risks associated with several different scenarios. For the STP Upland OU, USEPA evaluated three different scenarios: a maintenance worker scenario, a construction worker scenario, and a future residential scenario. For the STP River OU, USEPA evaluated two different scenarios: recreational use and residential use.

Determining potential human health risks from radionuclides involves converting radionuclide concentrations in soil/sediment (pCi/g) into dose rates (millirem per year) or excess lifetime cancer risks using a dose assessment model. At the STP Site, the potential health risks associated with radionuclides were evaluated using RESRAD. Developed by the Argonne National Laboratory for the Department of Energy, the RESRAD ("RESidual RADioactivity") code is commonly used by both NRC and USEPA for the evaluation of radioactively-contaminated sites. USEPA used the most current version of RESRAD[4] to evaluate risks to human health at the STP Site.

7.1.1 Identification of Contaminants of Concern

A variety of contaminants (including radionuclides, inorganics, volatile and semivolatile organic compounds) and media (soil, sediment, surface water, groundwater, fish tissue) were sampled at the site. USEPA identified in the risk assessment a number of radiological and chemical contaminants of potential concern that were carried through the risk assessment evaluation. This

[4] RESRAD Version 6.21; *User's Manual for RESRAD Version 6*, Argonne National Laboratory, Environmental Assessment Division, ANL/EAD-4, July 2001.

section focuses on only those contaminants of concern that drive the need for remedial action at the site.

The primary contaminants of concern at the site are radionuclides in the thorium decay chain and, to a lesser extent, the uranium decay chain. The primary media of concern are soil and sediment. For the STP River OU, the risk assessment evaluation did not distinguish between soil samples and sediment samples, but grouped all the soil and sediment sample results together for purposes of evaluating risk. Data usability was addressed in the *Data Quality Evaluation Technical Memorandum* (March 1996) and an addendum (August 1996), and all data used in the risk assessment were found suitable for use. Both documents are included in the Administrative Record for the site (incorporated by reference from the Administrative Record for Removal Action at the Kerr-McGee Sewage Treatment Plant Upland Operable Unit, October 2003).

Table 4 summarizes the contaminants of concern in the soil and sediment at the site, as well as the range of detected concentrations, the frequency of detection and the exposure point concentration for each contaminant of concern. Note that some of the radiological contaminants of concern were detected in other media at the site (i.e., groundwater, surface water, fish tissue) but did not present unacceptable risks in those media. As a result, information on those other media are not included in Table 4.

As mentioned in Section 5.5 above, the risk assessment also evaluated other chemical (non-radiological) contaminants. For example, at the STP Upland OU, arsenic and iron were identified in on-site soils (detected in all 161 samples), as was benzo(a)pyrene (5 detections out of 22 samples). Arsenic also was identified in on-site groundwater (7 detections out of 7 samples). At the STP River OU, arsenic and iron were detected in soils/sediments (detected in all 39 samples), as was benzo(a)pyrene (2 detections out of 3 samples). Additionally, arsenic was detected in surface water (5 detections out of 6 samples), and iron was detected in surface water (detected in all 6 samples) and fish tissue (detected in all 9 samples). Arsenic could be associated with the contamination from the REF but does not drive the risks nor the need for cleanup at the site. The other chemicals detected at the site are not believed to be site-related but were carried through the risk assessment evaluation anyway. However, as with arsenic, none of these other chemicals drive the risks nor the need for cleanup at the site.

7.1.2 Exposure Assessment

Section 1.4 of the May 2004 *Final Human Health Risk Assessment* contains the exposure assessment for the site. The exposure assessment estimates the magnitude, frequency, duration, and routes of exposure to the contaminants of potential concern at the site, and describes all assumptions, data and methods used to evaluate the potential for human exposure to the site contaminants. The conceptual site models used in the human health risk assessment are included here as Figures 3 and 4 (for the STP Upland and River OUs, respectively). Table 5 shows the exposure pathways that were evaluated in the risk assessment.

The exposure factors used as RESRAD inputs for the maintenance worker, construction worker, residential and recreational scenarios evaluated at the STP Site are shown in Tables 6 through 9, respectively. The exposure pathways evaluated in RESRAD for the four different scenarios were:

- Maintenance Worker: external gamma, inhalation (without radon) and soil ingestion.
- Construction Worker: external gamma, inhalation (without radon) and soil ingestion.
- Residential: external gamma, inhalation (without radon), soil ingestion, and plant ingestion (from a home garden). Radon inhalation, fish ingestion and surface water ingestion for the residential scenario were calculated separately.
- Recreational: external gamma, inhalation (without radon), and soil ingestion. Fish ingestion and surface water ingestion for the recreational scenario were calculated separately.

The exposure assumptions used to evaluate the risks from chemicals at the site can be found in Tables 1-2 through 1-6 of the May 2004 *Final Human Health Risk Assessment*. Those tables are not included in this ROD because non-radiological chemicals drive neither the risks nor the need for cleanup at the site.

7.1.3 Toxicity Assessment

USEPA classifies all radionuclides as known human carcinogens, based on their property of emitting ionizing radiation and on the extensive weight of evidence provided by epidemiological studies of radiogenic cancers in humans. Ionizing radiation has been shown to be a carcinogen, a mutagen, and a teratogen. Evaluation of the health risks of radionuclides typically consider only the carcinogenic effects, because, in most cases, cancer risks are limiting, exceeding both mutagenic and teratogenic risks. However, some radionuclides also can exhibit chemical toxicity. Uranium, for example, can be associated with noncarcinogenic toxic effects such as kidney damage. USEPA evaluated the carcinogenic risks from the radionuclides at the site and also the noncarcinogenic risks from uranium.

Excess lifetime cancer risks from intake of radionuclides were estimated using cancer slope factors (or risk coefficients) developed by USEPA using health effects data and dose and risk models from a number of national and international scientific advisory commissions and organizations. Radionuclide slope factors are calculated for each radionuclide individually, based on its unique chemical, metabolic and radioactive properties. These values have been incorporated into the updated Health Effects Assessment Summary Tables (HEAST) for radionuclides. Those same values were used in RESRAD to evaluate the risks at the STP Site and are shown in Table 10. Note that, unlike slope factors for most chemical contaminants, radionuclide ingestion and inhalation slope factors are not expressed as a function of body weight and time, and do not require corrections for gastrointestinal absorption or lung transfer efficiencies. Slope factors for radionuclides are characterized as central estimates in a linear model of the age-averaged lifetime total radiation cancer incidence risk per unit intake or exposure.

The potential for noncancer risks from uranium was evaluated in Appendix D of the May 2004 *Final Human Health Risk Assessment.* The evaluation involved converting the uranium activities (pCi/g) in soil and sediment to elemental concentrations (milligrams per kilogram), screening the maximum concentrations against USEPA Region 9's residential risk-based preliminary remediation goals, and then calculating the noncancer hazard index (the ratio of the contaminant intake to the reference dose). The results of the evaluation showed that uranium is not present at levels of concern at the site. More details regarding the evaluation of the noncancer risks from uranium can be found in the May 2004 *Final Human Health Risk Assessment.*

7.1.4 Risk Characterization

USEPA's risk guidance identifies a target cancer risk range of 10^{-4} to 10^{-6} (1 in 10,000 to 1 in a million) excess cancer risk for Superfund sites. If site contamination poses a risk of less than 10^{-6}, there is generally no need for action. Cancer risks greater than 10^{-4} generally require action to reduce and/or abate the risk, and cancer risks between 10^{-4} and 10^{-6} present a potential cause for remedial action. USEPA's guidance also indicates that a non-cancer hazard index exceeding 1.0 generally is a cause for action to reduce and/or abate the potential non-cancer risks associated with site contamination, while a hazard index less than 1.0 generally does not require action. The risks from the two different operable units of the STP Site are discussed below.

STP Upland OU

For the maintenance worker scenario, the cumulative excess lifetime cancer risks from all exposure pathways due to the contaminated soils at the site were estimated to be $2x10^{-3}$. Thorium-228 (an element in the thorium-232 decay chain) was the main contributor to the elevated risk, accounting for approximately 56% of the total risk, followed by Ra-228 (32% of the total risk).

For the construction worker scenario, the cumulative excess lifetime cancer risks from all exposure pathways due to the contaminated soils at the site were estimated to be $2x10^{-5}$. Thorium-228 again was the main contributor to the elevated risk, accounting for approximately 56% of the total risk, followed by Ra-228 (33% of the total risk).

For the future residential scenario, the cumulative excess lifetime cancer risks from all exposure pathways due to the contaminated soils and sediments at the site were estimated to be $6x10^{-3}$. Risks from radon were calculated separately but are included in the risk estimate cited above. Risks from direct and indirect exposure pathways (excluding radon) were $4x10^{-3}$, and Ra-228 was the main contributor to the elevated risk, accounting for approximately 55% of the total risk. Risks from radon were $2x10^{-3}$.

STP River OU

For the residential scenario, the cumulative excess lifetime cancer risks from all exposure pathways due to the contaminated soils and sediments at the site were estimated to be $6x10^{-3}$. Risks from radon, fish ingestion and surface water ingestion were calculated separately but are included in the risk estimate cited above. Risks from direct and indirect exposure pathways (excluding radon, fish ingestion and surface water ingestion) were $4x10^{-3}$, and Ra-228 was the main contributor to the elevated risk, accounting for approximately 57% of the total risk. Risks from radon were $2x10^{-3}$, risks from fish ingestion were $3x10^{-5}$, and risks from surface water ingestion were $7x10^{-7}$.

For the recreational scenario, the cumulative excess lifetime cancer risks from all exposure pathways due to the contaminated soils and sediments at the site were estimated to be $6x10^{-4}$. Risks from fish ingestion and surface water ingestion were calculated separately but are included in the risk estimate cited above. Risks from direct and indirect exposure pathways (excluding fish ingestion and surface water ingestion) were $6x10^{-4}$, and thorium-228 (an element in the thorium-232 decay chain) was the main contributor to the elevated risk, accounting for approximately 56% of the total risk, followed by Ra-228 (33% of the total risk). Risks from fish ingestion were $3x10^{-5}$ and risks from surface water ingestion were $1x10^{-7}$.

Overall Site

An overall summary of the risk assessment results is provided in the table below. More detailed results (including the contribution from each radionuclide) are shown in Table 11 (maintenance worker, construction worker and residential scenarios at STP Upland OU), Table 12 (residential scenario, recreational scenario, and radon inhalation at STP River OU), Table 13 (fish ingestion at STP River OU) and Table 14 (surface water ingestion at STP River OU). Even more detailed information, including the contribution from each radionuclide broken down by exposure pathway, can be found in Appendix B of the May 2004 *Final Human Health Risk Assessment*.

As shown in the table below, the estimated cumulative excess lifetime cancer risks due to the radiologically-contaminated soils and sediments at the site exceed the acceptable risk range of 10^{-6} to 10^{-4} for both the maintenance worker and residential scenarios at the STP Upland OU and for both the residential and recreational scenarios at the STP River OU.

Operable Unit	Scenario	Cumulative Excess Lifetime Cancer Risks - Radionuclides				
		Direct and Indirect Exposure Pathways	Radon	Fish Ingestion	Surface Water Ingestion	TOTAL RISKS
STP Upland OU	Maintenance Worker	$2x10^{-3}$	NA	NA	NA	$2x10^{-3}$
	Construction Worker	$2x10^{-5}$	NA	NA	NA	$2x10^{-5}$
	Residential (future)	$4x10^{-3}$	$2x10^{-3}$	NA	NA	$6x10^{-3}$
STP River OU	Residential	$4x10^{-3}$	$2x10^{-3}$	$3x10^{-5}$	$7x10^{-7}$	$6x10^{-3}$
	Recreational	$6x10^{-4}$	NA	$3x10^{-5}$	$1x10^{-7}$	$6x10^{-4}$

As mentioned in Section 7.1.3 above, the potential non-cancer risks associated with uranium were evaluated in the human health risk assessment. The non-cancer hazard index associated with uranium under a residential scenario was less than 1.0 for both the STP Upland OU and the STP River OU, indicating that the risks associated with the chemical toxicity of uranium are not a concern at the site.

7.2 Summary of Ecological Risk Assessment

USEPA conducted a screening-level ecological risk assessment for the site to help understand the actual or potential risks to the environment posed by the contaminants at the site. The purpose of a screening-level assessment is to determine the potential for risks based on conservative assumptions and methodologies. A screening-level assessment consists of two primary steps: (1) screening-level problem formulation and ecological effects evaluation and (2) screening-level exposure estimate and risk characterization. Because ecological risks are not driving the need for cleanup at the site, only the most important highlights of the ecological risk assessment will be summarized in this ROD. More detailed information can be found in the May 2004 *Final Ecological Risk Assessment.*

7.2.1 Screening-Level Problem Formulation and Ecological Effects Evaluation

USEPA and Kerr-McGee both conducted terrestrial and aquatic community surveys at the site to help identify potential ecological receptors and evaluate potential impacts of site contaminants and cleanup activities on the ecosystem. The May 2004 *Remedial Investigation Report* and the May 2004 *Final Ecological Risk Assessment* contain detailed information about the results of those surveys and summarize the ecological setting of the site. Both documents are in the Administrative Record for the site. Although several federal- or state-listed threatened or endangered species[5] are known to exist in the general project area of DuPage County, no such species were identified at the site during the terrestrial and aquatic surveys.

Both radionuclide and chemical contaminants were detected at the site. The conceptual site models for the ecological risk assessment are depicted in Figures 5 through 8. Some contaminants such as uranium possess both radiological and chemical toxicity. However, there are no ecological benchmark values for uranium for the aquatic and terrestrial receptors of concern at the site. The chemical toxicity of uranium, therefore, was not evaluated in the ecological risk assessment. Also, USEPA expects that, on the population level, the radiological effects of uranium would supercede any potential chemical effects to ecological receptors and, therefore, the radiological benchmarks are considered adequately protective.

Radionuclides

For purposes of the screening-level evaluation for radionuclides at the site, radionuclide concentrations were screened for potential ecological effects using the U.S. Department of Energy (DOE) RAD-BCG model. This model provides a graded approach to evaluate compliance with specified limits on radiation dose to populations of aquatic animals, terrestrial plants and terrestrial animals. Specifically, these dose limits are:

- Aquatic animals: The absorbed dose should not exceed 1 rad/day from exposure to radiation or radioactive material releases into the aquatic environment.

- Terrestrial plants: The absorbed dose should not exceed 1 rad/day from exposure to radiation or radioactive material releases into the terrestrial environment.

- Terrestrial animals: The absorbed dose should not exceed 0.1 rad/day from exposure to radiation or radioactive material releases into the terrestrial environment.

Avoiding measurable impairment of reproductive capability is deemed to be the critical biological endpoint in establishing the dose limits for aquatic and terrestrial biota. To this end, appreciable population effects would not be expected at doses lower than 1 rad/day and 0.1 rad/day, respectively, thereby establishing a level of adequate protection.

The graded approach methodology used by the model incorporates both internal and external sources of dose and sets a limiting concentration for an environmental medium by back-calculating the concentration that would result in the applicable dose (e.g., the bulleted dose limits above). The DOE defines a biota concentration guide (BCG) as the limiting concentration

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[5]Federal-listed threatened or endangered species known to occur in DuPage County are the Indiana bat (endangered), the Eastern Prairie Fringed Orchid (threatened) and the Prairie Bush Clover (threatened). State-listed threatened or endangered species known to occur in DuPage County are the Yellow Headed Blackbird, the Black Tern, the Common Moorhen, the Black-Crowned Night Heron, the Great Egret, the Veery and the Least Weasel.

of a radionuclide in soil, sediment or water that would not cause the dose limits to be exceeded. The BCGs used in the model are derived from the most sensitive potential receptor for which radionuclide toxicity data exist (for reproductive effects) for a given contaminant. Therefore, these receptors should be considered conservative indicators of risk and protective of less sensitive species. The receptors used are: "riparian animal," "terrestrial animal," "aquatic animal" and "terrestrial plant."

The model compares a representative radionuclide concentration with generic BCGs and calculates a fraction, and in turn, those fractions are summed for each radionuclide in each medium. If the sum of the partial fractions is greater than 1.0, then the site does not pass the screen. Under this model, the first tier screen is the most conservative evaluation and uses the maximum detected concentration of each radionuclide. The second tier screen uses the arithmetic mean concentration to be more realistic of site conditions.

Chemicals

The chemical contaminants detected in the soil, sediment and surface water at the site were screened to identify those projected to be the most deleterious to ecological receptors. Such contaminants of potential concern were selected on the basis of comparison to existing ecologically-based benchmark values available from various published studies. In general, highly conservative assumptions are used in the development of these media- and constituent-specific benchmarks. The intent of such an approach is to provide an estimate of a threshold concentration below which adverse effects are considered unlikely to even the most sensitive receptors. As an added measure of conservatism, USEPA used the lowest reported benchmark value for the comparisons. Chemicals with hazard quotients greater than 1.0 were considered as contaminants of potential concern and those with hazard quotients greater than 10.0 were considered potential risk drivers. Chemicals for which benchmarks do not exist were not evaluated quantitatively.

The following groups of receptors were evaluated using the hazard quotient screening technique described above: microbial community, plants, invertebrates, mammals (specifically the deer mouse, least shrew, mink and raccoon) and birds (specifically the American robin, mallard, and great blue heron).

Seven screening assessment endpoints were selected to evaluate the risk from chemicals to ecological receptor populations at the site. The assessment endpoints and the corresponding representative species or community are:

- survival and reproduction of terrestrial mammalian omnivores (deer mouse)
- survival and reproduction of terrestrial mammalian insectivores (least shrew)
- survival and reproduction of terrestrial avian omnivores (American robin)
- survival and reproduction of semi-aquatic mammalian piscivores (mink)
- survival and reproduction of semi-aquatic mammalian omnivores (raccoon)

- survival and reproduction of semi-aquatic avian omnivores (mallard)
- survival and reproduction of semi-aquatic avian piscivores (great blue heron)

Ecological exposures to chemicals at the site were determined by estimating the concentration of each chemical in each relevant dietary component. Details regarding the exposure point concentrations and dietary intakes for each receptor species can be found in the May 2004 *Final Ecological Risk Assessment.*

7.2.2 Screening-Level Exposure Estimate and Risk Characterization

Radionuclides, STP Upland OU

The results of the RAD-BCG screening for the STP Upland OU using maximum concentrations (first tier) and mean concentrations (second tier) are provided in Tables 15 and 16, respectively. The STP Upland OU failed the first tier screen, indicating the potential for adverse impacts to the environment from the radiological contaminants at the site using the maximum concentrations. Ra-228 was the risk driver. However, the STP Upland OU passed the second tier screen, indicating that the mean concentrations at the site can be considered protective of sensitive receptors.

Radionuclides, STP River OU

The results of the RAD-BCG screening for the STP River OU using maximum concentrations (first tier) and mean concentrations (second tier) are provided in Tables 17 and 18, respectively. The STP River OU failed the first tier screen, indicating the potential for adverse impacts to the environment from the radiological contaminants at the site using the maximum concentrations. Ra-228 was the risk driver. However, the STP River OU passed the second tier screen, indicating that the mean concentrations at the site can be considered protective of sensitive receptors.

Radionuclides - Overall Site

Typically, when a site fails the screening level assessment a baseline ecological risk assessment would be recommended to provide a more site-specific, less conservative estimate of risks at the site. A baseline ecological risk assessment was not conducted at the STP Site because there are limited constituent-specific data for ecological receptors for radionuclides and there would be nothing with which to compare the results of a baseline risk assessment. In general, there are not a lot of data available for ecological receptors exposed to radionuclides, particularly the specific receptors of concern and/or the contaminants identified at this site. The lumped parameters, distribution coefficients and BCGs used in the screening level risk assessment were designed to be conservative and indicated the potential for ecological risks at the site, and a more detailed evaluation would not have refined that conclusion.

Furthermore, the cleanup standard of 7.2 pCi/g for combined Ra-228 and -226 being used during the ongoing removal action at the STP Upland OU and selected in this ROD for the STP River OU is protective of biota when compared to the toxicological thresholds used in the DOE-BCG model to calculate risk. The BCGs for Ra-228 and Ra-226 are 90 pCi/g and 100pCi/g, respectively. Implementation of the remedial action and cleanup standard selected in this ROD, therefore, is protective of biota. Although USEPA is not establishing a cleanup standard for total uranium (combined uranium-238, -234 and -235) for the STP Site, comparison of the highest concentrations of total uranium detected at the site to the BCG used in the model shows that uranium is not present at levels of concern to biota. The highest concentration of total uranium detected at the STP Site was two orders of magnitude less than the BCG of 2000 pCi/g used in the model.

Chemicals, STP Upland OU

For contaminants detected in STP Upland OU soils, fourteen inorganics, one volatile organic and 11 semivolatile organics (all polycyclic aromatic hydrocarbons) had hazard quotients greater than 1.0. Of these, seven inorganics (chromium, lead, manganese, iron, mercury, vanadium and zinc) had hazard quotients greater than 10.0.

Based on food web modeling for terrestrial receptors, metals were the primary accumulated contaminants of potential concern, particularly lead, mercury and zinc, and to a lesser extent, cadmium and chromium. The least shrew and American robin had the highest modeled burdens of these contaminants relative to benchmarks due to high accumulations in invertebrate prey.

With respect to chemicals at the STP Upland OU, mercury and lead were identified as the most important contaminants of potential concern. These two contaminants demonstrated high bioaccumulation in terrestrial receptors, primarily those that feed on invertebrate prey. Barium appeared to be the dominant contaminant of potential concern in surface water. Lead could be associated with the thorium materials from the REF, but mercury and barium are not known to be site-related.

Chemicals, STP River OU

For contaminants detected in STP River OU soils/sediments, nine inorganics and four semivolatile organics (all polycyclic aromatic hydrocarbons) had hazard quotients greater than 1.0. Of these, only 1 inorganic (mercury) had a hazard quotients greater than 10.0.

For surface water, six inorganics had hazard quotients greater than 1.0. Of these, only one (barium) had hazard quotients greater than 10.0.

Based on food web modeling, the concentrations of accumulated burdens of aluminum, mercury, chrysene and pyrene in ecological receptors exceeded ecotoxicological benchmarks. In particular, great blue heron and mallard had the highest modeled burdens of chemicals relative to benchmarks.

With respect to chemicals at the STP River OU, mercury, chrysene and pyrene were identified as the most important contaminants of potential concern. Barium appeared to be the dominant contaminant of potential concern in surface water. However, none of these contaminants are known to be associated with the thorium materials from the REF and likely are due to other sources of contaminants to the river (as discussed in Section 5.4 above).

7.3 Basis for Action

A response action at the STP Site is warranted because, using RME assumptions, the cumulative excess lifetime carcinogenic risk to human health exceeds 10^{-4} for both the recreational and residential use scenarios at the STP River OU and for the maintenance worker and future residential scenarios at the STP Upland OU. The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from the actual or threatened releases of hazardous substances into the environment.

8.0 Remedial Action Objectives and ARARs

8.1 Remedial Action Objectives

Consistent with the NCP and USEPA's RI/FS guidance, remedial action objectives (RAOs) were developed in the RI/FS for the protection of human health and the environment. RAOs are site-specific goals developed to address potential risks to human health and the environment, and specify the acceptable concentration limits for the contaminants and media of concern. RAOs can be based on applicable or relevant and appropriate requirements (ARARs), to-be-considered non-promulgated guidelines, and/or risk-based levels established for a site. Both the federal government and the State of Illinois have promulgated regulations related to the cleanup of thorium and uranium mill tailings. Although the regulations are not directly applicable to the STP Site, USEPA considers portions of the regulations to be relevant and appropriate for use at the site. As a result, the RAOs for the STP Site are:

- #1: Reduce risks to human health and the environment presented by sediments and soils containing elevated levels of total radium by reducing soil concentrations to levels that are consistent with the requirements outlined in 40 CFR Part 192 (the regulations implementing the Uranium Mill Tailings Radiation Control Act [UMTRCA]) and Illinois Source Material Milling Regulations; and

- #2: Mitigate, to the extent practicable, potential adverse effects to the environment as a result of implementation of remedial activities at the site.

The remedial action objectives are based on current and reasonably anticipated future land use at the site. For the STP River OU, current and future land use is a mixture of residential and recreational use. Although land use at the STP Upland OU does not currently include residential use, a portion of the STP Upland OU could become residential in the future.

The cleanup standard derived from 40 CFR 192 and the Illinois Source Material Milling Regulations is a health-based standard that is protective of human health and the environment. The standard is 5 pCi/g above background for combined radium (Ra-228 plus Ra-226). Background levels at the site are 2.2 pCi/g, resulting in a cleanup standard of 7.2 pCi/g. The risks identified in the human health risk assessment that are driving the need for cleanup at the site, as well as the potential risks to the environment identified in the ecological risk assessment, will be addressed by reducing the concentrations of total radium in soil and sediment to levels that meet the cleanup standard.

The objective of RAO #2 is to mitigate impacts the implementation of the various remedial alternatives could have on the environment. These potential impacts may be minimized through the use of appropriate engineering controls. Potential impacts associated with remedial activities should be mitigated to maintain wetlands and forest preserve areas, and impacts that cannot be avoided could be addressed through restoration activities.

STP Upland OU Removal Action

The ongoing time-critical removal action being implemented at the STP Upland OU under the October 2003 AOC is achieving the site-specific RAOs listed above. Under the removal action, Kerr-McGee is excavating and removing from the site the radiologically-contaminated soils that exceed the 7.2 pCi/g cleanup standard for the site. Kerr-McGee is excavating to predetermined cut depths based on the extensive characterization data available, and final excavation depths and locations are being verified to ensure that the proper depths are achieved. The removal action, including the verification of excavation depths, is being overseen by USEPA and IEMA/DNS. The excavated contaminated materials are being transported off-site to a licensed, permanent disposal site. Disturbed areas of the site are then being restored.

As described previously in Section 2.2 of this ROD, Kerr-McGee has completed the vast majority of the work required by the removal action. To date, Kerr-McGee has removed a total of 6,281 cubic yards of contaminated materials from the STP Upland OU, and only an estimated 170 cubic yards remain to be removed. Once those materials are removed and the final excavation area verified, all identified contamination exceeding the 7.2 pCi/g cleanup standard will have been removed and the removal action will have achieved the RAOs listed above. The STP Upland OU will then be available for unlimited use and unrestricted exposure.

8.2 Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121(d) of CERCLA requires that Superfund remedial actions at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA Section 121(d)(4). Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a Superfund site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not applicable, address problems or situations sufficiently similar to those encountered at the Superfund site that their use is well-suited to the particular site.

In addition to ARARs, guidance materials that have not been promulgated or regulatory standards that are not applicable or relevant and appropriate may be considered (including local/county requirements); these are referred to as items "to be considered" (TBC). While TBCs may be considered along with ARARs, they do not have the status of ARARs.

The ARARs and TBCs identified for the site are categorized into three types: chemical-specific, action-specific and location-specific. Chemical-specific ARARs establish the acceptable amounts or concentrations of a chemical that may be found in, or discharged to, the ambient environment. Action-specific ARARs are technology- or activity-based performance or design requirements associated with the potential remedial activities being considered. Location-specific ARARs establish requirements that protect environmentally-sensitive areas and other areas of special interest.

A list of the potential ARARs and TBCs identified for the STP Site are presented in Tables 19 through 21. In addition to Federal and State ARARs and TBCs, these tables also contain TBCs specific to DuPage County, Illinois.

The primary chemical-specific ARARs at the site are the cleanup standards found in 40 CFR 192 and similar regulations in the Illinois Source Material Milling Regulations at 32 IAC 332. The regulations in 40 CFR 192 contain USEPA's standards for cleanup of lands contaminated by uranium and thorium mill wastes. The standards apply only to the sites specifically designated under the Uranium Mill Tailings Radiation Control Act of 1978 but often have been used as criteria at uranium, thorium and radium sites because of the similarity of the problems. The regulations are not applicable to the STP Site but USEPA considers portions to be relevant and appropriate. Subpart B of 40 CFR 192 contains two different soil standards. One is for surface soil (5 pCi/g above background) and the other for subsurface soil (15 pCi/g above background). The surface soil standard was developed as a health-based standard and USEPA determined it to be relevant and appropriate for the STP Site. The subsurface standard was not a health-based standard but was developed as a practical measurement tool for use in locating subsurface deposits of high-activity tailings. The subsurface standard was not developed for situations where significant quantities of moderate or low activity tailings are involved (such as at the STP Site), and USEPA determined that it is not relevant and appropriate for the site. As a result, the cleanup standard established for the STP Site is 5 pCi/g above background for combined radium (the sum of Ra-228 from the thorium decay chain and Ra-226 from the uranium decay chain). Background at the site is 2.2 pCi/g, resulting in a cleanup standard of 7.2 pCi/g. The 7.2 pCi/g cleanup standard is considered protective of human health and the environment.

9.0 Description of Alternatives

Following development of the RAOs, a screening and evaluation of potential remedial alternatives was conducted in accordance with CERCLA and the NCP in the FS Report. Because the contaminated areas of the STP Upland OU are being addressed by the ongoing time-critical removal action being conducted pursuant to the October 2003 AOC, potential remedial alternatives were not evaluated for the STP Upland OU. The FS Report evaluated potential remedial alternatives only for the contaminated sediments and soils at the STP River OU (and for the Kress Creek Site, which is being addressed in a separate ROD). Therefore, use of the term "site" in Sections 9 and 10 of this ROD means the STP River OU.

First, a number of technology types and process options[6] for addressing the sediments and floodplain soils at the site were identified and screened (evaluated) based on technical implementability. Those retained after the first screening were then evaluated based on the expanded criteria of effectiveness, implementability and relative cost. The technology types and representative process options[7] retained following the two-step screening process then were combined to develop potential remedial alternatives for the site. The four remedial alternatives were:

Alternative 1: No Action
Alternative 2: Monitored Natural Recovery
Alternative 3: Excavation and Off-Site Disposal of Targeted Sediment/Soil Throughout the Site
Alternative 4: Capping of Targeted Sediment/Soil Throughout the Site

[6] An example of a technology type is "sediment removal" and an example process option within that technology type is "dredging."

[7] Selection of a particular process option as representative was done to streamline the development of potential remedial alternatives. A process option not selected as representative still could be considered during remedial design if its technology type is part of the selected remedial alternative.

9.1 Description of Remedy Components

Each of the four alternatives is briefly described below. More detailed information about each of the alternatives can be found in the May 2004 *Feasibility Study Report* which is included in the Administrative Record for the Site.

Alternative 1: No Action

(1) *Description of Alternative*: Under this alternative, no active remediation would occur at the site and no monitoring would be conducted to assess the overall condition of the site over time. Naturally-occurring processes (e.g., half-life decay, erosion, sedimentation) would occur on their own over time. No institutional controls would be put in place and no operation and maintenance activities would be conducted. Evaluation of the No Action alternative is required by the NCP and provides a baseline against which the other potential remedial alternatives are evaluated.

(2) *Treatment Technologies and Materials they will Address*: There is no treatment associated with this alternative.

(3) *Containment Component*: There is no containment component associated with this remedy.

(4) *Costs*: Zero

Alternative 2: Monitored Natural Recovery

(1) *Description of Alternative*: Under this alternative, no active remediation would occur at the site. This alternative includes recovery of the site through naturally-occurring chemical and physical processes as a means of reducing risk at the site. Given the time frame associated with the radioactive decay of the contaminants at the site (with thorium and uranium having half-lives of billions of years) and the length of time expected for contaminated floodplain soils to be slowly covered by clean overburden materials deposited through overbank flooding, it is expected that natural recovery through physical processes (i.e., erosion/redeposition and sedimentation/ deposition) would be most effective for the sediment areas. However, in this alternative, the progress of natural recovery processes throughout both floodplain and sediment areas would be tracked through monitoring. Since contaminated materials would remain in place, institutional controls (such as land use restrictions) to manage and/or control exposures during the recovery period may be necessary. No operation and maintenance activities would be conducted.

(2) *Treatment Technologies and Materials they will Address*: There is no treatment associated with this alternative.

(3) *Containment Component*: There is no containment component associated with this remedy other than that occurring through natural processes over time as clean sediments are deposited on top of contaminated sediments.

(4) *Costs*: The estimated present worth of this alternative is $50,000. This estimate is based on a 30-year monitoring program to assess overall conditions via site-wide surface scanning every 5 years, using a discount rate of 7% for all present worth calculations. The total estimated cost is provided in 2004 dollars.

Alternative 3: Excavation and Off-Site Disposal of Targeted Sediment/Soil Throughout the Site

(1) *Description of Alternative*: Under this alternative, targeted materials (defined as sediments, banks and floodplain soils exceeding 7.2 pCi/g) would be removed in-the-dry via mechanical excavation and transported off-site to a licensed disposal facility. Prior to excavation, targeted areas of the site would be isolated and dewatered to allow excavation in-the-dry. Targeted materials then would be excavated to predetermined cut depths based on the extensive characterization data available. Because targeted materials are buried under clean overburden materials in areas of the site, excavation and management of the overburden materials is a necessary component of this alternative so that the targeted materials can be addressed. No radiological verification would be conducted in the excavations, but excavation depths/locations would be verified to ensure that specified excavation cut depths had been achieved. Excavated overburden materials would be radiologically verified to ensure they were indeed "clean." Excavated targeted materials would be allowed to further dewater in a nearby staging area and then would be shipped off-site for disposal. An estimated 3,300 cubic yards of material at the STP River OU would be addressed under this alternative, including approximately 2,200 cubic yards of targeted materials and 1,100 cubic yards of clean overburden materials. Aquatic and terrestrial areas impacted by construction would be restored and improved (to the extent possible) after excavation activities are complete and stabilized and revegetated as necessary. Periodic monitoring and necessary maintenance would be conducted to assess the effectiveness of stabilization measures and progress toward restoration goals. No institutional controls would be needed.

(2) *Treatment Technologies and Materials they will Address*: This alternative does not include a treatment component. However, removal of approximately 2,200 cubic yards of targeted materials via excavation would permanently reduce the volume and mobility of contaminated materials at the site.

(3) *Containment Component*: There is no containment component associated with this remedy.

(4) *Costs*: The estimated present worth of this alternative is $1.8 million. This estimate is based on a two-month construction period followed by a 3-year monitoring program, using a discount rate of 7% for all present worth calculations. The total estimated cost is provided in 2004 dollars.

Alternative 4: Capping of Targeted Sediment/Soil Throughout the Site

(1) *Description of Alternative*: Under this alternative, certain targeted materials would be isolated under an engineered cap. So as not to reduce flood conveyance, overburden or targeted material would be removed (by the same methods used in Alternative 3) to a depth equal to the thickness of the cap prior to cap placement. The engineered cap would be designed according to USEPA and U.S. Army Corps of Engineers guidance. For purposes of the FS, the cap thickness was assumed to be 2 feet (with an additional armor layer thickness of 6 inches in sediment areas). (This concept is explained further in footnote[8].) An estimated 3,200 cubic yards of material at the STP River OU would need to be removed to facilitate capping (so as not to reduce flood conveyance), including approximately 2,100 cubic yards of targeted materials (which would be disposed at an off-site facility) and 1,100 cubic yards of clean overburden materials. Targeted materials remaining at the site would then be capped. The areal extent of capping is estimated to be approximately 1 acre, almost all of which would consist of floodplain soils. Restoration activities would be essentially the same as Alternative 3. After completion of construction and restoration activities, a long-term monitoring/operation and maintenance program would be conducted, including periodic monitoring to assess the effectiveness of stabilization measures and progress toward restoration goals, and surface gamma surveys of the site (focusing on targeted areas), bathymetry, and cap maintenance once every 5 years.

(2) *Treatment Technologies and Materials they will Address*: This alternative does not include a treatment component. However, removal of approximately 2,100 cubic yards of targeted materials via excavation would significantly reduce the volume and mobility of contaminated materials at the site.

(3) *Containment Component*: This alternative includes capping of certain targeted sediment/soil materials as described above. Institutional controls would be implemented (including placing restrictions on marine construction, dredging and near shore excavation throughout the site, and

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[8] For floodplain areas, the cap thickness is assumed to be 2 feet. If greater than 2 feet of overburden are present over targeted floodplain soils, no excavation or capping would occur, as the existing overburden layer provides an appropriate degree of protection from contact or proximity risk. If the combined depth of the overburden and targeted material is less than 2 feet, mechanical excavation to the bottom of the targeted material would occur and the excavation backfilled to grade. If the combined depth of the overburden and targeted material is greater than 2 feet, mechanical excavation to a depth of 2 feet would be followed by placement of the engineered cap and the original grade restored.

For sediment areas, a 6-inch armor layer would be placed atop the 2-foot cap to protect against the erosive forces of running water. If greater than 2.5 feet of overburden are present over targeted sediments, approximately 6 inches of overburden would be removed via mechanical excavation and replaced with a layer of armor stone to provide enhanced erosion resistance. If the combined depth of overburden and targeted sediments is less than 2.5 feet, mechanical excavation to the bottom of the targeted material would occur with no backfill; no cap or armor layer would be placed because all contaminated materials would be removed. If the combined depth of the overburden and targeted sediments is greater than 2.5 feet, mechanical excavation to a depth of 2.5 feet would be followed by placement of 2 feet of cap material and 6 inches of armor stone.

implementing deed/access restrictions for capped areas of the floodplain) to maintain cap integrity and ensure it functions as intended.

(4) *Costs*: The estimated present worth of this alternative is $1.6 million. This estimate is based on a two-month construction period followed by a 30-year monitoring program, using a discount rate of 7% for all present worth calculations. The total estimated cost is provided in 2004 dollars.

9.2 Common Elements and Distinguishing Features of Each Alternative

No active remediation would be conducted under Alternatives 1 and 2, while Alternatives 3 and 4 both actively remediate the site. Alternative 3 would remove all of the targeted materials from the STP River OU, while Alternative 4 would remove approximately 95% of the targeted materials and would cap the rest in place.

Alternatives 1 and 2 both would leave all targeted materials in place and would rely on natural chemical and physical processes to reduce risks at the site over time. Given the extremely long-lived nature of the thorium materials, the natural process of radioactive decay would not effectively reduce risks at the site for billions of years. As a result, risk reduction would have to be achieved over time through the natural physical processes such as erosion and sedimentation/deposition, which would slowly cover areas of targeted materials with clean materials deposited on top. In contrast, Alternatives 3 and 4 would achieve risk reduction by the end of the construction period for the remedial action (approximately two months).

The key ARARs associated with Alternative 3 (and Alternative 4 to a lesser extent) are the chemical-specific standards derived from 40 CFR 192 and Illinois Source Material Milling Regulations. Alternative 3 would meet the chemical-specific cleanup standard at the end of the remedial action, as all targeted materials (materials above the cleanup standard) would be removed from the site. Alternative 4 would leave some targeted materials at the site but they would be controlled under an engineered cap. However, as will be discussed further in Section 10 of this ROD, due to the long-lived nature of the thorium materials, the cap would have to be maintained for an unrealistic period of time to maintain its effectiveness.

9.3 Expected Outcomes of Each Alternative

Alternatives 1 and 2, which include no active remediation measures, would not achieve protectiveness in the foreseeable future. Alternatives 2 and 4, which leave all or some of the targeted materials in place at the site, would require long-term land-use restrictions because the targeted materials would remain in place for billions of years. Alternative 3, which removes all targeted materials from the site, would achieve the RAOs for the site and would leave the site available for unrestricted use and unlimited exposure at the completion of the remedial action (expected to last approximately two months).

9.4 Preferred Alternative

The preferred alternative described in the Proposed Plan for the STP River OU was Alternative 3. The estimated cost of the preferred alternative is $1.8 million.

10.0 Summary of Comparative Analysis of Alternatives

When selecting a remedy for a site, USEPA considers the factors set forth in Section 121 of CERCLA by conducting a detailed analysis of the remedial alternatives in accordance with the NCP, USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (OSWER Directive 9355.3-01) and USEPA's *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (OSWER 9200.1-23.P). The detailed analysis consists of an assessment of the individual alternatives against each of the nine evaluation criteria (two threshold, five primary balancing, and two modifying criteria) and a comparative analysis focusing upon the relative performance of each alternative against those criteria. The nine evaluation criteria are described below.

Threshold Criteria

1. **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed by the site are eliminated, reduced or controlled through treatment, engineering, or institutional controls. The selected remedy must meet this criterion.

2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** addresses whether a remedy will meet the applicable or relevant and appropriate requirements. The selected remedy must meet this criterion or a waiver of the ARAR must be obtained.

Primary Balancing Criteria

3. **Long-Term Effectiveness and Permanence** refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met.

4. **Reduction of Toxicity, Mobility, or Volume Through Treatment** addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume of the hazardous substances as their principal element. This preference is satisfied when treatment is used to reduce the principal threats at the site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media.

5. **Short-Term Effectiveness** addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction of the remedy until cleanup levels are achieved. This criterion also considers the effectiveness of mitigative measures and time until protection is achieved through attainment of the RAOs.

6. **Implementability** addresses the technical and administrative feasibility of a remedy from design through construction, including the availability of services and materials needed to implement a particular option and coordination with other governmental entities.

7. **Cost** includes estimated capital costs, annual operation and maintenance costs (assuming a 30-year time period), and net present value of capital and operation and maintenance costs, including long-term monitoring.

<u>Modifying Criteria</u>

8. **State Agency Acceptance** considers whether the State support agency concurs with the selected remedy for the site.

9. **Community Acceptance** addresses the public's general response to the remedial alternatives and the preferred alternative presented in the Proposed Plan. The ROD includes a responsiveness summary that summarizes the public comments and USEPA's response to those comments. The responsiveness summary is included as Appendix A.

The full text of the detailed analysis of the four remedial alternatives against the nine evaluation criteria (including both the individual analysis and the comparative analysis) is contained in the May 2004 *Feasibility Study Report* which is included in the Administrative Record for the Site. This section of the ROD summarizes the highlights of the comparative analysis.

10.1 Overall Protection of Human Health and the Environment

Alternatives 3 and 4 include measures to actively address the areas of targeted sediments, banks and floodplain soils at the site. Alternative 3 affords the highest degree of overall protection of human health and the environment since its implementation would result in the excavation and off-site disposal of the largest amount of targeted materials. Alternative 4 could provide an acceptable level of overall protection through removal of most of the targeted materials, containment of the remaining materials under an engineered cap, and institutional controls to maintain cap integrity.

Neither Alternative 1 nor Alternative 2 include active remediation measures. Alternative 2 would eventually reduce risks at the site through naturally-occurring processes, and the site would be monitored to track progress toward achieving protectiveness; however, risks to human health and the environment would continue until such time as the naturally-occurring processes reduced risks at the site. Alternative 1 may eventually reduce risks at the site through naturally-occurring processes, but no monitoring would be conducted to verify that protectiveness had been achieved.

10.2 Compliance with ARARs

Alternative 3 is based upon and would achieve the chemical-specific ARARs found in 40 CFR 192 and the Illinois Source Material Milling Regulations. Alternative 4 would not achieve the quantitative levels prescribed in those ARARs; however, the federal regulations (40 CFR 192) provide for the use of "supplemental standards" that may be appropriate under this alternative, and Alternative 4 could meet those supplemental standards. Both Alternatives 3 and 4 could meet the action-specific and location-specific ARARs for the site.

Alternative 2 would eventually achieve the chemical-specific ARARs through the naturally-occurring processes previously described, and the site would be monitored to assess the overall condition of the site over time and to track progress toward achieving ARARs. Action-specific ARARs (associated with monitoring activities) would be met. No location-specific ARARs would apply.

Since no active remedial measures or monitoring activities would take place under Alternative 1, no action-specific or location-specific ARARs apply. The chemical-specific ARARs may eventually be achieved through the naturally-occurring processes previously described, but no monitoring would be conducted to assess the overall condition of the site over time or to verify that ARARs had been achieved.

10.3 Long-Term Effectiveness and Permanence

Alternative 3 provides the highest degree of long-term effectiveness and permanence, as targeted sediments, banks and floodplain soils would be removed from the site and disposed in a licensed off-site disposal facility. By removing the targeted materials from the site and meeting the cleanup standards specified by the chemical-specific ARARs, the residual risks at the site would be protective of human health and the environment for the long-term and the site would be available for unrestricted use and unlimited exposure.

Alternative 4 could perform well, since approximately 95% of the targeted materials would be removed and disposed off-site and the remaining materials would be isolated from exposure under an engineered cap. Potential risks over the long-term would still exist, however, due to the possibility for changing land use or catastrophic events (i.e., severe floods, ice scour). Long-term monitoring and maintenance of the capped areas would be necessary, along with institutional controls. Given the extremely long-lived nature of the radionuclides at the site, however, the monitoring, maintenance and institutional control measures would have to be in place for an unrealistically long period of time. As a result, the long-term effectiveness and permanence of Alternative 4 is questionable.

Alternatives 1 and 2 leave all contaminated materials in place at the site with no active remedial measures. Both of these alternatives may eventually achieve protectiveness through naturally-occurring processes. While half-life decay, erosion/redeposition, and sedimentation/deposition may eventually provide adequate protection, an unacceptably long period of time would be required until that protection would be achieved. Contaminants would remain on the surface (of both floodplain and streambed areas) for a very long time and would have the potential to migrate due to variability in stream flow, erosion and flooding. Given the extremely long-lived nature of the radionuclides at the site, any administrative controls used under Alternative 2 would have to be in place for an unrealistically long period of time. When compared to the level of protection, effectiveness and permanence provided by Alternative 3 (and to a somewhat lesser extent by Alternative 4), Alternatives 1 and 2 do not result in the same level of effectiveness or permanence.

10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

None of the four alternatives include any active treatment of contaminated materials; therefore, there would be no reduction in toxicity, mobility, or volume through treatment. All of the alternatives do, however, result in varying degrees of reductions to mobility and/or volume.

Alternative 3 would provide the greatest volume and mobility reductions at the site since all targeted soils and sediments would be removed from the site and disposed in an off-site facility. Alternative 4 would provide some volume and mobility reductions as approximately 95% of the targeted soils and sediments would be removed and the remainder would be isolated under an engineered cap.

Under Alternatives 1 and 2, the mobility of targeted materials would be reduced somewhat over time as they continue to be isolated under a layer of overburden as a result of sedimentation and deposition. Additionally, the volume and toxicity of the contaminants would be reduced through half-life decay, although at an extremely slow rate.

10.5 Short-Term Effectiveness

There would be short-term impacts associated with both Alternatives 3 and 4, and the remedial activities would take place throughout the site for the duration of implementation, estimated to be approximately two months. Both alternatives would cause disruption along the river and in the floodplain; impact the water column; alter/destroy the benthic habitat, some wetlands and forest preserve areas; disrupt boating and other recreation activities on the river; and lead to increased truck traffic. Monitoring of surface water and ambient air would take place under both alternatives, with results used to identify, evaluate and address measurable effects of construction. Since excavation and capping activities are to take place in-the-dry, individual reaches could flood during construction of either alternative due to water flow restrictions necessary to implement the alternative.

Implementation of appropriate health and safety practices should protect both remediation workers and the community from unacceptable exposure to radioactivity during construction. While the duration of the short-term impacts would be approximately two months, completion of Alternatives 3 or 4 should result in immediate achievement of RAO #1 (risk reduction). Regarding RAO #2 (mitigating adverse effects to the environment from implementation of remedial activities), the length of time it would take for the benthic community to recover from the effects of either of these alternatives is unknown. The recovery time for in-stream areas would depend on the resulting substrate and stream morphology. The recovery of forested areas (affected by the construction of haul roads, for instance) could take decades. However, both alternatives include improvements (to the extent possible) to aquatic and terrestrial areas during restoration, replacing undesirable or invasive, non-native species with native species.

There would be no short-term impacts associated with implementation of Alternatives 1 or 2 since they do not include any active remedial measures.

10.6 Implementability

All four alternatives are technically implementable, and the necessary personnel, equipment, services and materials are readily available for all alternatives.

Alternative 3 is the best option from an administrative implementability standpoint, since all necessary approvals and permits could be secured, requirements met and access to private property obtained.

Since significant quantities of contaminated sediments and floodplain soils would remain in place under Alternative 2 and lesser amounts would remain in place under Alternative 4, deed and access restrictions would likely be necessary for those alternatives, for an unrealistically long period of time, to control future land use. Long-term monitoring would be necessary for Alternative 4 since the engineered cap would have to be monitored and maintained.

10.7 Cost

Cost includes estimated capital costs and annual operation and maintenance costs (assuming a 30-year time period). Present worth cost represents the total cost of an alternative over time in terms of today's dollar value. In accordance with USEPA guidance, cost estimates are expected to be accurate within a range of +50 to -30 percent.

Detailed cost estimates for each of the four alternatives are presented in the May 2004 *Feasibility Study Report*. The estimated present worth costs to implement the four potential remedial alternatives at the STP River OU are as follows:

Alternative 1: $0
Alternative 2: $50,000
Alternative 3: $1.8 million
Alternative 4: $1.6 million

Of the two active remedial options, Alternative 3 would remove all of the targeted materials from the site at only a 12 percent increase in cost compared to Alternative 4, which would remove approximately 95% of the targeted materials from the site. Alternative 3 also would eliminate the difficult-to-quantify, long-term social and practical "costs" associated with ensuring the very long-term integrity of containment associated with Alternative 4.

10.8 State Agency Acceptance

The State of Illinois (including both the Illinois EPA and the IEMA/DNS) have been involved with the site throughout the RI/FS process, have reviewed documents and provided comments to USEPA, and provided support at the public meeting for the proposed plan.

Although the State of Illinois has not yet provided a concurrence letter for this ROD, the State has indicated that it intends to concur with the selection of Alternative 3 for the STP River OU and that it does not support Alternatives 1, 2 or 4. The State also has indicated that it intends to concur with EPA's determination that no further action is needed at the STP Upland OU after the completion of the ongoing time-critical removal action there. The State of Illinois' concurrence letter will be added to the Administrative Record upon receipt.

10.9 Community Acceptance

During the public comment period, the community expressed its support for Alternative 3. The community does not consider Alternatives 1, 2 or 4 to be adequately protective because the radioactive contamination would remain at the site for an extremely long period of time.

11.0 Principal Threat Wastes

The principal threats to human health and the environment are the radioactive thorium and uranium decay chain materials in sediment and soil. Although the NCP establishes the expectation that USEPA will use treatment to address the principal threats posed by a site whenever practicable, there are no viable treatment alternatives for the radioactive materials at this site. Alternative 3 addresses the principal threats at the STP River OU by removing the targeted materials from that portion of the site and sending them off-site to a permanent, licensed disposal facility. The ongoing time-critical removal action at the STP Upland OU is addressing the principal threats by removing the targeted materials from that portion of the site and sending them off-site to a permanent, licensed disposal site.

12.0 Selected Remedy

12.1 Identification of the Selected Remedy and Summary of the Rationale for its Selection

STP Upland OU

Based on EPA's determination that the ongoing time-critical removal action at the STP Upland OU is achieving the RAOs for the site, as discussed in Section 8 of this ROD, the selected remedy for the STP Upland OU is no further action after completion of the ongoing time-critical removal action.

STP River OU

Based on the analysis of the nine criteria conducted in the May 2004 *Feasibility Study Report* and summarized in Section 10 of this ROD, the selected remedy for the STP River OU is Alternative 3, Excavation and Off-Site Disposal of Targeted Sediment/Soil Throughout the Site. This alternative represents the best balance of overall protectiveness, compliance with ARARs, long-term effectiveness and permanence, costs, and other criteria, including State and community acceptance.

12.2 Description of the Selected Remedy

STP Upland OU

No further action is needed at the STP Upland OU after completion of the ongoing time-critical removal action.

STP River OU

Section 9 of this ROD presented a brief description of Alternative 3 (and the other alternatives). A more detailed description and discussion of the selected remedy is provided here. Specific details regarding how the remedy will be implemented will be determined during the remedial design phase.

Under the selected remedy, targeted materials at the STP River OU (including sediments, banks and floodplain soils) would be removed in-the-dry via mechanical excavation and disposed at an off-site facility. It is estimated that a total of approximately 3,300 cubic yards of materials would be addressed, including approximately 2,200 cubic yards of targeted material and 1,100 cubic yards of overburden material. Because targeted materials are buried under clean overburden materials in areas of the site, excavation and management of the overburden materials is a necessary component of this alternative. Of the 2,200 cubic yards of targeted material, approximately 200 cubic yards are sediments and approximately 2,000 cubic yards are banks and/or floodplain soils. A summary of the estimated volumes to be addressed as part of the remedy, broken down by geographic location, is presented in Table 22. (Note that Table 22 includes volumes associated with the Kress Creek Site, as both the Kress Creek and Sewage Treatment Plant Sites were addressed in the same RI and FS reports. The geographic location called "West Branch DuPage River: STP to Confluence" represents the STP River OU; the remaining areas are part of the Kress Creek Site and are being addressed in a separate ROD.) The volume estimates will be refined during the remedial design phase, prior to implementation of the selected remedy.

As noted above, prior to the implementation of the selected remedy, all of the details regarding how the remedy will be implemented must be worked out during what is known as the remedial design phase. During the design phase, the owners of affected properties will be involved in detailed discussions regarding the work to be conducted on their property, and their concerns will be addressed in the final design to the extent practicable. Access agreements from property owners and any necessary approvals from regulatory agencies also will be secured, and the final design documents must be approved by USEPA.

In order to facilitate efficient implementation of the selected remedy, access roads, haul roads and staging areas will be developed as appropriate. Such roads and staging areas will be sited to avoid wetlands, desirable tree species and floodway limits to the extent practicable. Grubbing and clearing of vegetation and possible relocation of utilities may be necessary to adequately locate and develop such areas. Additionally, appropriate erosion and sedimentation controls will be put in place around staging areas as necessary. Access to the active work areas of the site will be appropriately restricted by installing fencing or other perimeter barriers.

In general, targeted areas will be dewatered prior to excavation. The site will likely be segmented into discrete, manageable reaches so that dewatering and excavation can occur in a stepwise manner from upstream to downstream. In this way, only one segment of the site will be disrupted at a time. Segments will be determined based on excavation rates and the presence of logical break points in the river (based on access, morphology, or other factors).

In preparation for dewatering, and depending on the location, the targeted areas to be excavated will be isolated or contained by using barriers such as silt curtains, sand bags, earthen berms, and/or sheetpiling, as appropriate. The actual diversion or containment method for each segment of the site will be determined during the detailed design phase. In some cases, entire segments of the river may be isolated and the water diverted using a series of bypass pumps. Appropriate erosion and sedimentation control measures also will be employed, as determined during the detailed design, to mitigate the migration of soils or suspended solids during implementation of the remedy.

Following dewatering of a segmented area, excavation of the targeted materials will proceed from upstream to downstream using mechanical excavation methods. At each location, overburden materials (if any) will be removed first, followed by targeted materials. Excavation will proceed to predetermined cut depths based on the extensive site characterization data available, and final excavation depths will be verified using Global Positioning System (GPS) survey techniques.

After excavation, excavated materials will be hauled to a staging area. Overburden materials and targeted materials will be hauled and stockpiled separately to prevent mixing. Depending on the characteristics of the excavated materials, the materials likely will need to be further dewatered (and may need to be stabilized) before they can be transported off-site for disposal. The dewatering method and stabilizing agent (if any) to be used will be determined during the detailed design phase.

Excavated overburden materials will be radiologically verified to ensure they do not exceed the cleanup standard; any overburden materials found to exceed the cleanup standard will be treated as targeted materials. Excavated targeted materials will be shipped off-site for disposal.

Following completion of excavation activities, both the aquatic and terrestrial areas impacted by construction will be mitigated and restored and, to the extent practicable, improved. Disturbed areas will be restored to appropriate, stable conditions, including revegetation of appropriate areas and stabilization of streambanks. The restoration approach will vary from location to location throughout the site based on location characteristics (e.g., high or low energy aquatic environment, floodplain, residential property, forest preserve property, etc.) in accordance with a restoration plan to be developed for the site. The specific restoration approach for each area of the site will be determined during the detailed design phase. Periodic monitoring and necessary maintenance of the restored areas also will be conducted to assess the effectiveness of the stabilization and revegetation measures.

During implementation of the remedy, appropriate engineering controls (such as dust control techniques) will be conducted, as determined during the detailed design phase, to mitigate short-term effects during the cleanup. Environmental monitoring (such as air monitoring and water column monitoring) also will be conducted, as determined during the detailed design phase, to evaluate short-term impacts from the construction activities and respond to them as needed.

12.3 Summary of the Estimated Remedy Costs and Time Required for Implementation

The estimated cost of the selected remedy for the STP River OU is $1.8 million. The construction of the remedy is estimated to take approximately two months to complete. A detailed estimate of the costs is provided in Table 23.

12.4 Expected Outcomes of the Selected Remedy

The selected remedy for the STP River OU will achieve the RAOs for the site and will leave the STP River OU available for unrestricted use and unlimited exposure at the completion of the remedial action (expected to last approximately two months). The ongoing time-critical removal action at the STP Upland OU also is achieving the RAOs for the site and will leave the STP

Upland OU available for unrestricted use and unlimited exposure at the completion of the removal action. As specified in RAO #1, the site would meet the cleanup levels derived from 40 CFR 192 and the Illinois Source Material Milling Regulations, 7.2 pCi/g combined radium. This cleanup level is considered protective of human health and the environment (see Section 8.2 of this ROD) and no institutional controls will be needed at the site at the completion of the remedial action.

13.0 Statutory Determinations

Under CERCLA Section 121 and the NCP, remedies selected for Superfund sites are required to be protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a waiver is justified), be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the toxicity, mobility or volume of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy for the STP River OU meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The current risks at the STP River OU are due to the presence of radioactively-contaminated sediments and soils. Implementation of the selected remedy will be protective of human health and the environment through the removal and off-site disposal of radioactively-contaminated sediments, banks and floodplain soils from the site. The selected remedy will use the health-based cleanup standard of 7.2 pCi/g combined radium derived from 40 CFR 192 and the Illinois Source Material Milling Regulations, and this cleanup standard is considered protective of human health and the environment. At the completion of the remedial action the site will be available for unlimited use and unrestricted exposure.

13.2 Compliance with ARARs

Section 121(d) of CERCLA requires that Superfund remedial actions meet ARARs. A brief discussion of the primary ARARs is provided below. In addition to ARARs, non-enforceable guidelines, criteria, and standards may be useful in evaluating remedial alternatives. As described previously in Section 8.2 of this ROD, these guidelines, criteria and standards are known as TBCs. The selected remedy will comply with the ARARs listed in Tables 19 through 21.

13.2.1 Chemical-Specific ARARs

Chemical-specific ARARs are usually health-based or risk-based numerical values or methods that establish acceptable amounts or concentrations of a chemical in the environment. The primary chemical-specific ARARs for the STP Site are:

- 40 CFR 192, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings. 40 CFR 192 contains USEPA's standards for cleanup of lands contaminated by uranium and thorium mill wastes. These federal regulations apply only to the sites specifically named in the Uranium Mill Tailings Radiation Control Act of 1978. Consequently, the regulations are not legally applicable to the STP Site but portions are relevant and appropriate. The cleanup standard for soils and sediments at the site derived from these regulations is 7.2 pCi/g combined radium.

- 32 Ill. Admin. Code 332, Licensing Requirements for Source Material Milling Facilities. These state regulations contain the licensing requirements for source material milling facilities in Illinois and apply to the REF. The regulations are not legally applicable to the STP Site but portions are relevant and appropriate. The cleanup standard for soils and sediments at the site derived from these regulations is 7.2 pCi/g combined radium.

- Clean Water Act, 33 U.S.C. 1251 *et seq*. The federal Clean Water Act establishes relevant and appropriate surface water quality standards to protect against adverse effects. Any water generated during excavation must meet Federal surface water quality standards before being discharged back to the river. Related to these standards are the federal ambient water quality criteria. These criteria are non-enforceable guidelines that identify chemical levels for surface waters and generally may be related to a variety of assumptions such as use of a surface water body as a water supply. These criteria may be TBCs.

- State Surface Water Quality Standards and Effluent Standards. The State of Illinois is authorized to administer the federal Clean Water Act through its laws and regulations. 35 Ill. Admin. Code 302 and 304 establish relevant and appropriate surface water quality standards and effluent limits to restore, maintain, and enhance purity of water of the state. These requirements are applicable and water generated during excavation must meet State surface water quality standards and/or effluent limits before being discharged back to the river. Also, to the extent that remedial work is conducted in or near the river, such work is to be conducted so as to prevent or minimize an exceedance of a water quality criterion.

13.2.2 Action- and Location-Specific ARARs

Action-specific requirements are usually technology- or activity-based requirements or limitations on cleanups. Location-specific requirements are restrictions solely because the cleanup takes place in special locations. The primary action- and location-specific ARARs for the STP Site are:

- Endangered Species Act, and Illinois Endangered Species Protection Act. Both federal and state laws have statutory provisions that are intended to protect threatened or endangered species. Under the federal act, federal agencies are required to verify that any action authorized, funded or carried out by them is not likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of a critical habitat of such species. No endangered or threatened species have been found within or near the site to date.

- Preservation of Historical and Archaeological Data Act, National Historic Preservation Act (NHPA) and Illinois State Agency Historic Resources Preservation Act. These ARARs establish requirements for the recovery and preservation of historical and archaeological data, and require measures to minimize harm to historic resources. Under the NHPA, response actions must take into account effects on properties on or eligible for inclusion on the National Registry of Historic Places. No such properties have been identified within or near the site to date.

- Transportation of Radioactive Materials. The applicable state regulations at 32 Ill. Admin. Code 341 establish requirements for packaging, preparation for shipment and transportation of radioactive material.

- U.S. DOT and Illinois DOT Transportation and Handling Regulations. The applicable federal regulations at 49 CFR 171 and the state regulations at Title 92, Chapter I, Subchapter C provide transportation and handling requirements for hazardous materials.

- Federal and State Floodplain and Wetland Regulations and Executive Orders. The applicable federal regulations and executive orders, and state regulations, govern construction and filling in floodplain and wetland areas. 40 CFR 6.302 sets forth USEPA policy and guidance for carrying out Executive Orders 11988 and 11990. Executive Order 11988 requires federal agencies to evaluate the potential effects of actions they may take in a floodplain and to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain. Executive Order 11990 requires federal agencies conducting certain activities to avoid, to the extent possible, adverse impacts associated with the destruction or loss of wetlands, or to avoid or minimize adverse impacts if no practicable alternative exists.

  17 Ill. Admin. Code 3708 also provides applicable rules governing construction and filling in the regulatory floodway of rivers, lakes and streams of DuPage County (and other specific counties). 92 Ill. Admin. Code 708 and 17 Ill. Admin. Code 3706 provide protection of public health, safety, and general welfare by restricting damageable floodplain improvements and uses which increase flood damage potential elsewhere. 20

ILCS 830 directs State agencies to preserve, enhance and create wetlands where possible and to avoid adverse impacts to wetlands in order to maintain the economic and social value of the State's remaining wetlands. Although local requirements cannot be ARARs, the DuPage County Countywide Stormwater and Floodplain Ordinance (No. OSM-0001-89) is an important TBC that governs development (i.e., excavation or fill, alteration, change in land use, or activities affecting stormwater discharge) affecting floodplain/ riparian areas and wetlands.

- Pertinent portions of the federal Fish and Wildlife Coordination Act (16 U.S.C. 661 *et seq.*) and Clean Water Act Section 404, 40 CFR 230 and 33 CFR 320-330. These applicable regulations require federal agencies to take into consideration the effect that water-related remedial actions will have on fish and wildlife and to take action to prevent loss or damage to these resources.

13.3 Cost Effectiveness

USEPA has determined that the selected remedy for the STP River OU is cost effective. A cost-effective remedy in the Superfund program is one whose costs are proportional to its overall effectiveness. USEPA evaluated the overall effectiveness of the potential remedial alternatives for the STP River OU in the May 2004 *Feasibility Study* by evaluating the following three criteria: long-term effectiveness and permanence, reduction in toxicity, mobility and volume through treatment, and short-term effectiveness. USEPA then compared the overall effectiveness to cost to determine whether an alternative is cost effective. Of the remedial alternatives evaluated for this site, Alternative 3 (the selected remedy) provides the highest degree of overall effectiveness and costs only 12 percent more than Alternative 4, whose long-term effectiveness and permanence is questionable.

13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

USEPA believes that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the site, and represents the best balance of trade-offs among the alternatives with respect to the primary balancing criteria. Treatment technologies are not a component of the selected remedy because there are no viable treatment alternatives for the radioactively-contaminated soils and sediments at the site. As discussed in Section 10 of this ROD, the selected remedy (Alternative 3) provides the highest degree of long-term protectiveness and represents a permanent solution for the site with no need for long-term maintenance or institutional controls. The short-term risks for the selected remedy are the same as those associated with the other active remediation alternative considered (Alternative 4), and while neither alternative reduces the toxicity, mobility or volume through treatment, the selected remedy removes a higher volume of contamination from the site. The selected remedy also is more easily implemented than Alternative 4. Lastly, both the State support agency and the community view the selected remedy as the only acceptable alternative.

Overall, the selected remedy affords the best balance of tradeoffs when compared to the other alternatives.

13.5 Preference for Treatment as a Principal Element

USEPA believes that the selected remedy is protective of human health and the environment and utilizes permanent solutions to the maximum extent practicable. As discussed in Section 11 of this ROD, the principal threats to human health and the environment at the site are the radioactive thorium and uranium decay chain materials in sediments and soils. The selected remedy does not satisfy the statutory preference for treatment as a principal element because there are no viable treatment alternatives for the radioactive materials at the site.

13.6 Five-Year Review Requirements

The NCP requires that the remedial action be reviewed no less often than every five years if the remedial action results in hazardous substances, pollutants or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. Because the remedy selected in this ROD will not result in hazardous substances, pollutants or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, five-year reviews at this site are not required. As described in Section 12.4 of this ROD, the remedy selected in this ROD will leave the site available for unlimited use and unrestricted exposure at the completion of the remedial action. The site will meet the cleanup levels derived from 40 CFR 192 and the Illinois Source Material Milling Regulations, 7.2 pCi/g combined radium. This cleanup level is considered protective of human health and the environment (see Section 8.2 of this ROD) and no institutional controls will be needed at the site at the completion of the remedial action.

14.0 Documentation of Significant Changes

The Proposed Plan for the STP Site was released for public comment on May 24, 2004, and the public comment period ran from May 26 through June 25, 2004. The Proposed Plan identified Alternative 3, Excavation and Off-Site Disposal of Targeted Sediment/Soil Throughout the Site, as the preferred alternative for the STP River OU. The Proposed Plan also identified that the preferred alternative for the STP Upland OU was no further action after completion of the ongoing time-critical removal action. USEPA reviewed all written and verbal comments submitted during the public comment period and determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

TABLES

TABLE 1

Summary of Total Radium Radioactivity by Matrix and Reach

Kerr-McGee Sewage Treatment Plant Site

Matrix	Reach	Count	Frequency of Detection	Minimum (pCi/g)	Maximum (pCi/g)	Average (pCi/g)
Sediment	West Branch DuPage River Background	8	100	0.068	3 754	2.117
	West Branch DuPage River Upstream	28	100	0 480	14.250	3.541
Soil	STP Background	24	75	0.000	4.988	1.623
	STP On-Site	143	99	0.000	58.130	5.492
	West Branch DuPage River Background	5	100	2.063	4.619	3.491
	West Branch DuPage River Upstream	21	100	1.336	445.900	36.196
Surface Water	STP On-Site	1	100	0.995	0.995	0.995
	West Branch DuPage River Background	3	100	0.266	0.590	0.378
	West Branch DuPage River Upstream	6	100	0.026	2.069	0.978
Groundwater, Unfiltered	STP Background	1	100	1.305	1.305	1.305
	STP On-Site	4	100	0.754	14.030	6.974
Groundwater, filtered	STP Background	1	100	0.340	0.340	0.340
	STP On-Site	4	100	0.540	2.955	1.751
Fish	West Branch DuPage River Background	3	100	-0.015	0.103	0.052
	West Branch DuPage River Upstream	9	100	-0.003	0.068	0.028

Notes:

pCi/g - picoCuries per gram

1) USEPA data (as provided in CH2M HILL Database [Revised STP&KCKdata4 (03 May06).xls]) are included, and represent laboratory analytical data.
2) Non-detect values were assigned a value of zero prior to calculation.
3) Duplicate samples were not included in calculations because many of the parent samples could not be identified in the CH2M HILL Database.
4) Groundwater data are presented in units of picoCuries/Liter (pCi/L).

TABLE 2

Summary of Total Thorium Radioactivity by Matrix and Reach

Kerr-McGee Sewage Treatment Plant Site

Matrix	Reach	Count	Frequency of Detection	Minimum (pCi/g)	Maximum (pCi/g)	Average (pCi/g)
Sediment	West Branch DuPage River Background	8	100	1.001	2.466	1.761
	West Branch DuPage River Upstream	28	100	0.890	93.805	7.571
Soil	STP Background	21	100	0.601	4.307	1.981
	STP On-Site	136	100	0.622	98.700	9.461
	West Branch DuPage River Background	5	100	2.212	3.329	2.756
	West Branch DuPage River Upstream	21	100	2.836	732.167	65.613
Surface Water	STP On-Site	1	100	0.137	0.137	0.137
	West Branch DuPage River Background	2	100	-0.002	0.031	0.014
	West Branch DuPage River Upstream	6	100	0.085	0.737	0.413
Groundwater, Unfiltered	STP Background	0	--	--	--	--
	STP On-Site	4	100	13.993	39.681	20.493
Groundwater, filtered	STP Background	1	100	-0.005	-0.005	-0.005
	STP On-Site	4	100	0.144	0.510	0.256
Fish	West Branch DuPage River Background	3	100	0.004	0.006	0.005
	West Branch DuPage River Upstream	9	100	0.005	0.050	0.014

Notes:

pCi/g - picoCuries per gram

1) USEPA data (as provided in CH2M HILL Database [Revised STP&KCKdata4 (03 May06).xls]) are included, and represent laboratory analytical data.

2) Non-detect values were assigned a value of zero prior to calculation.

3) Duplicate samples were not included in calculations because many of the parent samples could not be identified in the CH2M HILL Database.

4) Groundwater data are presented in units of picoCuries/Liter (pCi/L).

TABLE 3

Summary of Total Uranium Radioactivity by Matrix and Reach

Kerr-McGee Sewage Treatment Plant Site

Matrix	Reach	Count	Frequency of Detection	Minimum (pCi/g)	Maximum (pCi/g)	Average (pCi/g)
Sediment	West Branch DuPage River Background	8	100	0.125	1.990	0.880
	West Branch DuPage River Upstream	28	100	0.519	9.723	1.597
Soil	STP Background	22	100	0.067	2.330	1.358
	STP On-Site	138	100	0.124	21.982	2.214
	West Branch DuPage River Background	5	100	1.949	2.657	2.243
	West Branch DuPage River Upstream	21	100	1.237	25.280	4.552
Surface Water	STP On-Site		100	0.122	0.122	0.122
	West Branch DuPage River Background	2	100	0.879	0.937	0.908
	West Branch DuPage River Upstream	6	100	0.080	1.190	0.755
Groundwater, Unfiltered	STP Background	0	--	--	--	--
	STP On-Site	4	100	11.359	20.209	16.228
Groundwater, filtered	STP Background	1	100	1.269	1.269	1.269
	STP On-Site	4	100	0.836	5.459	2.773
Fish	West Branch DuPage River Background	3	100	0.005	0.013	0.009
	West Branch DuPage River Upstream	9	100	0.003	0.011	0.006

Notes:

pCi/g - picoCuries per gram

1) USEPA data (as provided in CH2M HILL Database [Revised STP&KCKdata4 (03 May06).xls]) are included, and represent laboratory analytical data.

2) Non-detect values were assigned a value of zero prior to calculation.

3) Duplicate samples were not included in calculations because many of the parent samples could not be identified in the CH2M HILL Database.

4) Groundwater data are presented in units of picoCuries/Liter (pCi/L).

TABLE 4

Summary of Contaminants of Concern and Medium-Specific Exposure Point Concentrations for Human Health Risk Assessment

Kerr-McGee Sewage Treatment Plant Site

Scenario Timeframe: Current
Medium: Soil/Sediment
Exposure Medium: Soil/Sediment

Exposure Point	Constituent of Concern (COC)	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration (EPC)	Exposure Point Concentration Units	Statistical Measure
		MIN	MAX					
STP Upland OU- On-Site Soil	Radium-226	0.558	9.86	pCi/g	144/156	2.0	pCi/g	95% UCL
	Radium-228	0.442	446	pCi/g	149/156	13	pCi/g	95% UCL
	Thorium-232	0.225	302	pCi/g	146/146	10	pCi/g	95% UCL
	Uranium-235	0.00532	0.811	pCi/g	142/148	0.09	pCi/g	95% UCL
	Uranium-238	0.376	12.0	pCi/g	143/146	1.5	pCi/g	95% UCL
STP River OU- On-Site Sediment/ Floodplain Soil	Radium-226	0.6	4.8	pCi/g	34/48	1.7	pCi/g	95% UCL
	Radium-228	0.243	109	pCi/g	44/44	6.9	pCi/g	95% UCL
	Thorium-232	0.185	99.2	pCi/g	48/48	10	pCi/g	95% UCL
	Uranium-235	0.0052	0.283	pCi/g	38/38	0.063	pCi/g	95% UCL
	Uranium-238	0.248	6.0	pCi/g	48/48	1.3	pCi/g	95% UCL

KEY

pCi/g: picoCuries per gram
95% UCL: 95% Upper Confidence Limit on the arithmetic mean
MIN: Minimum Concentration
MAX: Maximum Concentration

DESCRIPTION

This table presents the constituents of concern (COC) and exposure point concentrations for each of the COCs detected in soil and sediment at the site. The exposure point concentration is the concentration used to estimate the exposure and risk from each COC in the soil/sediment. The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the constituent was detected in the samples collected at the site), the exposure point concentration (EPC) and how the EPC was derived. The table indicates that the listed radionuclides were detected in nearly every sample collected at the site and that the 95% Upper Confidence Limit on the arithmetic mean was used as the exposure point concentration.

TABLE 5

Selection of Exposure Pathways for Human Health Risk Assessment

Kerr-McGee Sewaae Treatment Plant Site

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/ Future	Soil	Surface Soil	On-site Soil (STP Upland OU)	Maintenance Worker	Adult	Ingestion	Quantitative	Maintenance workers performing general maintenance work are currently present at STP property.
						Dermal	Quantitative	
						Inhalation	Quantitative	
				Construction Worker	Adult	Ingestion	Quantitative	Construction workers performing intermittent construction work may be exposed to on-site soil at STP property.
						Dermal	Quantitative	
						Inhalation	Quantitative	
	Ground-Hater	Ground-water	Tap Water (STP Upland OU)	Maintenance Worker	Adult	Ingestion	Quantitative	Future use of site groundwater as drinking water source is unlikely; however, hypothetical exposure to shallow groundwater through ingestion of drinking water was evaluated for maintenance workers.
						Dermal	None	Future use of site groundwater as drinking water supply is unlikely.
			Ponded Water in Excavation Pit (STP Upland OU)	Construction Worker	Adult	Dermal	Quantitative	Construction worker performing intermittent construction work may be exposed to ponded water in excavation pits.
	Sediment/ Floodplain Soil	Sediment/ Floodplain Soil	West Branch DuPage River (STP River OU)	Resident	Adult/ Child	Ingestion	Quantitative	Residents living next to site may contact sediment/ floodplain soil.
						Dermal	Quantitative	
						Inhalation	Quantitative	
				Recreational Visitor	Adult/ Child	Ingestion	Quantitative	Recreational visitor may contact sediment/floodplain soil.
						Dermal	Quantitative	
						Inhalation	Quantitative	

TABLE 5
Selection of Exposure Pathways for Human Health Risk Assessment

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
	Surface Water	Surface Water	West Branch DuPage River (STP River OU)	Resident	Adult/ Child	Ingestion	Quantitative	Residents living next to site may contact surface water.
						Dermal	Quantitative	
				Recreational Visitor	Adult/ Child	Ingestion	Quantitative	Recreational visitor may contact surface water.
						Dermal	Quantitative	
	Surface Water/ Sediment	Fish Tissue	West Branch DuPage River (STP River OU)	Resident	Adult/ Child	Ingestion	Quantitative	Residents living next to site may consume fish caught locally.
				Recreational Visitor	Adult/ Child	Ingestion	Quantitative	Recreational visitor may consume fish caught locally.
Future	Soil	Surface Soil	On-site Soil (STP Upland OU)	Resident	Adult/ Child	Ingestion	Quantitative	Future land use is expected to remain the same (i.e., STP), but portions of property could become residential.
						Dermal	Quantitative	
						Inhalation	Quantitative	
	Ground-water	Ground-water	Tap Water (STP Upland OU)	Resident	Adult/ Child	Ingestion	None	Future use of site groundwater as drinking water supply is unlikely.
						Dermal	None	
						Inhalation	None	

TABLE 6
Exposure Factors for Maintenance Worker Scenario - Radionuclides
Kerr-McGee Sewage Treatment Plant Site

Description	Exposure Factor	Units	Source
Area of Contaminated zone	1.00E+04	m^2	1, 2
Thickness of contaminated zone	2	m	1, 2
Time since placement of material	0	yr	1, 2
Cover depth	0	m	1, 2
Density of contaminated zone	1.5	g/cm^3	1, 2
Contaminated zone erosion rate	0.001	m/vr	1 2
Inhalation rate	5750	m^3/yr	Standard reference inhalation rate (23 m3/day) over 250 dayslyear
Mass loading for inhalation	1.00E-04	g/m^3	1, 2
Exposure duration	25	yr	3
Shielding factor, inhalation	1	unitless	Based on assumption that worker spends all time on site out of doors
Sheilding factor, external gamma	1	unitless	all time on site out of doors
Fraction of time spent indoors	0	unitless	1, 2
Fraction *of* time spent outdoors (on site)	0.685	unitless	Site-specific assumption
Shape factor flag, external gamma	1	unitless	1, 2
Soil ingestion	25	glyr	1, 2
Mass loading for fotiar deposition	1.00E-04	g/m^3	1, 2

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

Sources:

1. U.S. DOE. Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil April 1993, ANL/EAIS-8
2. U.S. DOE. Manual for Implementing Residual Radioactive Material Guidelines Using Resrad, Version 6.0 August 2001, ANL/EAD-4
3. U.S. EPA. Supplemental Guidance to RAGS: Standard Default Exposure Factors, March 1991.

TABLE 7

Exposure Factors for Construction Worker Scenario - Radionuclides

Kerr-McGee Sewage Treatment Plant Site

Description	Exposure Factor	Units	Source
Area of Contaminated zone	1.00E+04	m^2	1, 2
Thickness of contaminated zone	2	m	1, 2
Time since placement of material	0	yr	1, 2
,Cover depth	0	m	1, 2
Density of contaminated zone	1.5	g/cm^3	1, 2
Contaminated zone erosion rate	0.001	m/yr	1, 2
Inhalation rate	1380	m^3/yr	Standard reference inhalation rate (23 m3/day) over 60 days/year
Mass loading for inhalation	1.00E-04	g/m^3	1, 2
Exposure duration	1	yr	Site-specific assumption, consistent with assumptions for estimating chemical exposure
Shielding factor, inhalation	1	unitless	Based on assumption that worker spends all time on site out *of* doors
Sheilding factor, external gamma	1	unitless	Based on assumption that worker spends all time on site out of doors
Fraction of time spent indoors	0	unitless	Based on assumption that worker spends all time on site out of doors
Fraction of time spent outdoors (on site)	0.164	unitless	Site-specific assumption, based on 60 dayslyear
Shape factor flag, external gamma	1	unitless	1, 2
Soil ingestion	6	g/yr	Site-specific assumption, based on 60 dayslyear
Mass loading for foliar deposition	1.00E-04	g/m^3	1, 2

Pathwavs evaluated:
External gamma
Inhalation (w/o radon)
Soil ingestion

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00 x $1C^{-4}$, which is equivalent to 0.0001.

Sources:
1. U.S. DOE. Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil April 1993, ANUEAIS-8
2. U.S. DOE. Manual for Implementing Residual Radioactive Material Guidelines Using Resrad, Version 6.0 August 2001, ANL/EAD-4

TABLE 8

Exposure Factors for Residential Exposure Scenario - Radionuclides

Kerr-McGee Sewage Treatment Plant Site

Description	Exposure Factor	Units	Source
Area of Contaminated zone	1.00E+04	m^2	1, 2
Thickness of contaminated zone	2	m	1, 2
'Time since placement of material	0	yr	1, 2
Cover depth	0	m	1, 2
Density of contaminated zone	1.5	g/cm^3	1, 2
Precipitation	1	mlyr	1, 2
Irrigation	NA	m/yr	1, 2
Irrigation mode (over head)	NA		1, 2
Inhalation rate	8400	m^3/yr	1, 2
Mass loading for inhalation	1.00E-04	g/m^3	1, 2
Exposure duration	30	yr	1, 2
Shielding factor, inhalation	0.4	unitless	1, 2
Sheilding factor, external gamma	0.7	unitless	1, 2
Fraction of time spent indoors	0.5	unitless	1, 2
Fraction of time spent outdoors (on site)	0.25	unitless	1, 2
Shape factor flag, external gamma	1	unitless	1, 2
Fruits, vegetables and grain consumption	160	kg/yr	1, 2
Leafy vegetable consumption	14	kg/yr	1, 2
Fish consumption	not used	kg/yr	1, 2
Soil ingestion	36.5	g/yr	1,2
Mass loading for foliar deposition	1.00E-04	g/m^3	1, 2
Depth of soil mixing layer	1.50E-01	m	1, 2
Depth of roots	9.00E-01	m	1, 2
Wet weight crop yield for non-leafy	7.00E-01	kg/m^2	1, 2
Wet weight crop yield for leafy	1.50E+00	kg/m^2	1, 2
Growing season for non-leafy	1.70E-01	yr	1, 2
Growing season for leafy	2.50E-01	yr	1, 2
Translocation Factor for non-leafy	0.1	unitless	1, 2
Translocation Factor for leafy	1	unitless	1, 2
Dry foliar interception fraction for non-leafy	0.25	unitless	1, 2
Dry foliar interception fraction for leafy	0.25	unitless	1, 2
Wet foliar interception fraction for non-leafy	0.25	unitless	1, 2
Wet foliar interception fraction for leafy	0.25	unitless	1, 2

TABLE 8

Exposure Factors for Residential.Exposure Scenario - Radionuclides

Kerr-McGee Sewage Treatment Plant Site

Description	Exposure Factor	Units	Source
Weathering removal constant for vegetation	2	$year^{-1}$	1, 2
Storage times of contaminated foodstuffs - non-leafy	14	days	1, 2
Storage times of contaminated foodstuffs - leafy	1	day	1, 2
Thickness of building foundation	0.15	m	1, 2
Bulk density of building foundation	2.4	g/cm^3	1, 2
Total porosity of the building foundation	0.1	unitless	1, 2
Volumetric water content of the building material	0.03	unitless	1, 2
Diffusion coefficient for radon gas (foundation material)	3.00E-07	m/sec	1, 2
Diffusion coefficient fo radon gas (in contaminated zone soil)	2.00E-06	m/sec	1, 2
Radon vertical dimension of mixing	2	m	1, 2
Average building air exchange rate	0.5	l/hr	1, 2
Height of the building (room)	2.5	m	1, 2
Building interior area factor	0	unitless	1, 2
Building depth below ground surface	-1	m	1, 2
Emanating power of Rn-222 gas	0.25	unitless	1, 2
Emanating power of Rn-220 gas	0.15	unitless	1, 2
Average annual wind speed	2	m/sec	1, 2

Pathwavs evaluated:
External gamma
Inhalation (w/o radon)
Plant ingestion
Soil ingestion
Radon Inhalation

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001,

Sources:
1. U.S. DOE. Data Collection Handbook to Support Modeling the impacts of Radioactive Material in Soil April 1993, ANUEAIS-8
2. **U.S.** DOE. Manual for Implementing Residual Radioactive Material Guidelines Using Resrad, Version 6.0 August 2001, ANUEAD-4

TABLE 9

Exposure Factors for Recreational Exposure Scenario - Radionuclides

Kerr-McGee Sewage Treatment Plant Site

Description	Exposure Factor	Units	Source
Area of Contaminated zone	1.00E+04	m^2	1, 2
Thickness of contaminated zone	2	m	1, 2
Time since placement of material	0	yr	1, 2
Cover depth	0	m	1, 2
Density of contaminated zone	1.5	g/cm^3	1, 2
Contaminated zone erosion rate	0.001	m/yr	1, 2
Inhalation rate	1242	m^3/yr	Standard reference inhalation rate (23 m3/day) over 54 days/year
Mass loading for inhalation	1.00E-04	g/m^3	1, 2
Exposure duration	30	yr	1, 2
Shielding factor, inhalation	1	unitless	Based on assumption that worker spends all time on site out of doors
Sheilding factor, external gamma	1	unitless	Based on assumption that worker spends all time on site out of doors
Fraction of time spent indoors	0	unitless	Based on assumption that worker spends all time on site out of doors
Fraction of time spent outdoors (on site)	0.148	unitless	Site-specific assumption, based on 54 days/year
Shape factor flag, external gamma	1	unitless	1, 2
Fish consumption	5.4	kg/yr	1, 2
Soil ingestion	5.4	g/yr	Site-specific assumption, based on 54 days/year
Surface Water Ingestion	0.05	l/day	Region 4 Bulletins, Human Health Risk Assessment (USEPA Region IV 2003).

Pathwavs evaluated:

External gamma
Inhalation (w/o radon)
Soil ingestion
Fish Ingestion
Surface Water Ingestion

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

Sources:

1. U.S. DOE. Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil April 1993, ANUEAIS-8
2. U.S. DOE. Manual for Implementing Residual Radioactive Material Guidelines Using Resrad, Version 6.0 August 2001, ANL/EAD-4

TABLE 10

Summary of Cancer Slope Factors Used for Estimating Radionuclide Risks
Kerr-McGee Sewage Treatment Plant Site

Nuclide	Ground external radiation slope factors, 1/yr per (pCi/g):	Inhalation, slope factors, 1/(pCi):	Food ingestion, slope factors, 1/(pCi):	Soil ingestion, slope factors, 1/(pCi):
Ac-227+D	1.47E-06	2.13E-07	6.51E-10	6.51E-10
Pa-231	1.39E-07	7.62E-08	2.26E-10	2.26E-10
Pb-210+D	4.21E-09	3.08E-08	3.44E-09	3.44E-09
Ra-226+D	8.49E-06	2.82E-08	5.14E-10	5.14E-10
Ra-228+D	4.53E-06	4.37E-08	1.43E-09	1.43E-09
Th-228+D	7.79E-06	3.58E-07	4.22E-10	4.22E-10
Th-230	8.18E-10	3.40E-08	1.19E-10	1.19E-10
Th-232	3.42E-10	4.33E-08	1.33E-10	1.33E-10
U-234	2.52E-10	2.78E-08	9.55E-11	9.55E-11
U-235+D	5.43E-07	2.50E-08	9.73E-11	9.73E-11
U-238+D	8.66E-08	2.36E-08	1.20E-10	1.20E-10
Po-218		3.70E-12		
Pb-214		6.20E-12		
Bi-214		1.50E-11		
Rn-220		1.90E-13		
Po-216		3.00E-15		
Pb-212		3.90E-11		
Bi-212		3.70E-11		

Note: Numbers in table are shown in scientific notation, also known as exponential notation.
Example: 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

Source: USEPA, 1999, *Cancer Risk Coefficients for Environmental Exposure to Radionuclides* .

TABLE 11

Summary of Excess Lifetime Cancer Risk (Radionuclides), STP Upland OU

Kerr-McGee Sewage Treatment Plant Site

Residential Scenario

Radio-Nuclide	Risk	Fraction
Ac-227	4.17E-10	0.00000
Pa-231	3.73E-10	0.00000
Pb-210	9.18E-05	0.02230
Ra-226	3.69E-04	0.08970
Ra-228	2.28E-03	0.55350
Th-228	1.37E-03	0.33220
Th-230	6.13E-15	0.00000
Th-232	5.46E-06	0.00130
U-234	7.36E-11	0.00000
U-235	8.34E-07	0.00020
U-238	3.31E-06	0.00080
Total	4E-03	1

Maintenance Worker Scenario

Risk	Fraction
2.07E-10	0.00000
7.29E-11	0.00000
1.54E-06	0.00090
1.88E-04	0.11190
5.45E-04	0.32440
9.43E-04	0.56080
1.06E-15	0.00000
1.18E-06	0.00070
7.09E-12	0.00000
5.46E-07	0.00030
1.54E-06	0.00090
2E-03	1

Construction Worker Scenario

Risk	Fraction
6.64E-13	0.00000
4.50E-13	0.00000
1.16E-08	0.00050
2.55E-06	0.10990
7.57E-06	0.32580
1.31E-05	0.56220
2.00E-18	0.00000
1.02E-08	0.00040
3.10E-14	0.00000
7.43E-09	0.00030
2.06E-08	0.00090
2E-05	1

Risks from Radon (Residential Scenario):

Radio-Nuclide	Risk
Rn-222	1.79E-04
Po-218	3.51E-04
Pb-214	4.45E-04
Bi-214	8.70E-04
Rn-220	4.41E-05
Po-216	6.92E-07
Pb-212	2.83E-05
Bi-212	1.44E-05
Total	2E-03

Radon not evaluated for non-residential scenarios (radon exposure is evaluated only as an indoor air pathway)

Notes:

Risks are based on potential exposure through both direct (external) and indirect exposure pathways.
Indirect exposure pathways include inhalation, soil ingestion and fruit and vegetable ingestion for residents.
Indirect exposure pathways include inhalation and soil ingestion for worker and recreational scenarios.
Radon risks include both indoor and outdoor inhalation pathways. Indoor radon risks are 90% of total radon risks.
Risks were calculated using RESRAD Version 6.21.
Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

TABLE 12

Summary of Excess Lifetime Cancer Risk (Radionuclides), STP River OU

Kerr-McGee Sewage Treatment Plant Site

Residential Scenario

Radio-Nuclide	Risk	Fraction
Ac-227	2.92E-10	0.00000
Pa-231	2.61E-10	0.00000
Pb-210	7.80E-05	0.01980
Ra-226	3.14E-04	0.07960
Ra-228	2.23E-03	0.56620
Th-228	1.31E-03	0.33210
Th-230	5.72E-15	0.00000
Th-232	5.62E-06	0.00140
U-234	6.87E-11	0.00000
U-235	5.84E-07	0.00010
U-238	3.09E-06	0.00080
Total	4E-03	1

Recreational Scenario

Risk	Fraction
6.07E-11	0.00000
1.91E-11	0.00000
4.84E-07	0.00090
5.64E-05	0.09990
1.89E-04	0.33470
3.18E-04	0.56280
3.04E-16	0.00000
2.79E-07	0.00050
1.73E-12	0.00000
1.34E-07	0.00020
4.95E-07	0.00090
6E-04	1

Risks from Radon (Residential Scenario):

Radio-Nuclide	Risk
Rn-222	1.52E-04
Po-218	2.99E-04
Pb-214	3.78E-04
Bi-214	7.40E-04
Rn-220	4.23E-05
Po-216	6.63E-07
Pb-212	2.71E-05
Bi-212	1.38E-05
Total	2E-03

Radon not evaluated for recreational scenario (radon exposure is evaluated only as an indoor air pathway)

Notes:

Risks are based on potential exposure through both direct (external) and indirect exposure pathways.

Indirect exposure pathways include inhalation, soil ingestion and fruit and vegetable ingestion for residents.

Indirect exposure pathways include inhalation and soil ingestion for worker and recreational scenarios.

Radon risks include both indoor and outdoor inhalation pathways. Indoor radon risks are 90% of total radon risks.

Risks were calculated using RESRAD Version 6.21.

Risks from fish and surface water ingestion were calculated separately using USEPA exposure factors - excess lifetime cancer risks from fish ingestion are **3E-05**. Excess lifetime cancer risks from surface water ingestion are **1.4E-07** for a recreational scenario and **7.1E-07** for a residential scenario.

Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

TABLE 13

Summary of Excess Lifetime Cancer Risk (Radionuclides), STP River OU, Fish Ingestion

Kerr-McGee Sewage Treatment Plant Site

Contaminant	EPC in Fish (pCi/g)	Fish Consumption Rate (glday)	Exposure Frequency (dayslyear)	Exposure Duration (years)	Intake (pCi)	Slope factor (1/pCi)	Excess Lifetime Cancer Risk
Radium-228+D	0.068	25	365	30	1.87E+04	1.43E-09	2.68E-05
Thorium-232+D	0.012	25	365	30	3.40E+03	1.33E-10	4.52E-07
Thorium-228+D	0.015	25	365	30	4.09E+03	4.22E-10	1.73E-06
						Total	2.90E-05

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

TABLE 14

Summary of Excess Lifetime Cancer Risk (Radionuclides), STP River OU, Surface Water Ingestion

Kerr-McGee Sewage Treatment Plant Site

Residential Exposure

	EPC in Surface Water (pCi/L)	Water Consumption Rate (Uday)	Exposure Frequency (dayslyear)	Exposure Duration (years)	Intake (pCi)	Slope factor (1/pCi)	Excess Lifetime Cancer Risk
Radium-226	0.822	0.05	350	24	3.45E+02	3.86E-10	1.33E-07
Radium-228	1.247	0.05	350	24	5.24E+02	1.04E-09	5.45E-07
Thorium-232	0.173	0.05	350	24	7.25E+01	1.01E-10	7.32E-09
Uranium-235	0.036	0.05	350	24	1.53E+01	7.18E-11	1.1OE-09
Uranium-238	0.582	0.05	350	24	2.44E+02	8.71E-11	2.13E-08
						Total	7.08E-07

Recreational Exposure

	EPC in Surface Water (pCi/L)	Water Consumption Rate (L/day)	Exposure Frequency (dayslyear)	Exposure Duration (years)	Intake (pCi)	Slope factor (1/pCi)	Excess Lifetime Cancer Risk
Radium-226	0.822	0.05	54	30	6.66E+01	3.86E-10	2.57E-08
Radium-228	1.247	0.05	54	30	1.01E+02	1.04E-09	1.05E-07
Thorium-232	0.173	0.05	54	30	1.40E+01	1.01E-10	1.41E-09
Uranium-235	0.036	0.05	54	30	2.95E+00	7.18E-11	2.12E-10
Uranium-238	0.582	0.05	54	30	4.71E+01	8.71E-11	4.11E-09
						Total	1.36E-07

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

TABLE 15

Results of RAD-BCG Screening, Maximum Concentrations, STP Upland OU

Kerr-McGee Sewage Treatment Plant Site

	Water (pCi/L)		Sediment (pCi/g)	
Nuclide	Partial Fraction	Source of Calculation	Partial Fraction	Source of Calculation
Ce-144				
Cs-135				
Cs-137			7.1E-03	TA-Lumped, Default
Co-60				
Eu-154				
Eu-155				
H-3				
I-129				
I-131				
Pu-239				
Ra-226			2.0E-01	TA-Lumped, Default
Ra-228			1.0E+01	TA-Lumped, Default
Sb-125				
Sr-90				
Tc-99				
Th-232			2.0E-01	TA-Lumped, Default
U-233				
U-234			2.5E-03	TA-Lumped, Default
U-235			2.9E-04	TA-Lumped, Default
U-238			7.6E-03	TA-Lumped, Default
Zn-65				
Zr-95				
Partial fractions			1.1E+01	
Result:	1.1E+01			
	You have failed the terrestrial site screen			

TA: Terrestrial Animal

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00 x 10^{-4}, which is equivalent to 0.0001.

TABLE 16

Results of RAD-BCG Screening, Mean Concentrations, STP Upland OU

Kerr-McGee Sewage Treatment Plant Site

	Water (pCi/L)		Sediment (pCi/g)	
Nuclide	Partial Fraction	Source of Calculation	Partial Fraction	Source of Calculation
Ce-144				
Cs-135				
Cs-137			2.9E-03	TA-Lumped, Default
Co-60				
Eu-154				
Eu-155				
H-3				
I-129				
I-131				
Pu-239				
Ra-226			3.3E-02	TA-Lumped, Default
Ra-228			1.8E-01	TA-Lumped, Default
Sb-125				
Sr-90				
Tc-99				
Th-232			4.3E-03	TA-Lumped, Default
U-233				
U-234			2.4E-04	TA-Lumped, Default
U-235			2.8E-05	TA-Lumped, Default
U-238			8.3E-04	TA-Lumped, Default
Zn-65				
Zr-95				
Partial fractions			2.2E-01	
Total sum of fractions:	2.2E-01			
	You have passed the terrestrial site screen			

TA: Terrestrial Animal

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

TABLE 17

Results of RAD-BCG Screening, Maximum Concentrations, STP River OU

Kerr-McGee Sewage Treatment Plant Site

	Water (pCi/L)		Sediment (pCi/g)	
Nuclide	Partial Fraction	Source of Calculation	Partial Fraction	Source of Calculation
Ce-144				
Cs-135				
Cs-137				
Co-60				
Eu-154				
Eu-155				
H-3				
I-129				
I-131				
Pu-239				
Ra-226	2.0E-01	RA-Lumped, Default	4.7E-02	RA-Lumped, Default
Ra-228	3.7E-01	RA-Lumped, Default	1.2E+00	RA-Lumped, Default
Sb-125				
Sr-90				
Tc-99				
Th-232	5.7E-04	AA Default BiV	7.6E-02	RA-Lumped, Default
U-233				
U-234	2.8E-03	AA Default BiV	1.8E-03	RA-Lumped, Default
U-235	1.7E-04	AA Default BiV	7.6E-05	RA-Lumped, Default
U-238	2.6E-03	AA Default BiV	2.4E-03	RA-Lumped, Default
Zn-65				
Zr-95				
Partial fractions	5.8E-01		1.4E+00	
Total sum of fractions (water and sediment):				2.0E+00
Result:	You have failed the site screen			

RA: Riparian Animal
AA: Aquatic Animal
BiV: Bioaccumulation value

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

TABLE 18

Results of RAD-BCG Screening, Mean Concentrations, STP River OU

Kerr-McGee Sewage Treatment Plant Site

	Water (pCi/L)		Sediment (pCi/g)	
Nuclide	Partial Fraction	Source of Calculation	Partial Fraction	Source of Calculation
Ce-144				
Cs-135				
Cs-137				
Co-60				
Eu-154				
Eu-155				
H-3				
I-129				
I-131				
Pu-239				
Ra-226	1.1E-01	RA-Lumped, Default	1.3E-02	RA-Lumped, Default
Ra-228	1.8E-01	RA-Lumped, Default	7.3E-02	RA-Lumped, Default
Sb-125				
Sr-90				
Tc-99				
Th-232	3.3E-04	AA Default BiV	5.1E-03	RA-Lumped, Default
U-233				
U-234	1.9E-03	AA Default BiV	2.0E-04	RA-Lumped, Default
U-235	9.2E-05	AA Default BiV	1.3E-05	RA-Lumped, Default
U-238	1.5E-03	AA Default BiV	4.6E-04	RA-Lumped, Default
Zn-65				
Zr-95				
Partial fractions	2.9E-01		9.2E-02	
Total sum of fractions (water and sediment):				3.8E-01
Result:	You have passed the site screen			

RA: Riparian Animal
AA: Aquatic Animal
BiV: Bioaccumulation value

Note: Some numbers in table are shown in scientific notation, also known as exponential notation. For example, 1.00E-04 is another way of expressing 1.00×10^{-4}, which is equivalent to 0.0001.

TABLE 19
Chemical-Specific ARARs and TBCs
Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
FEDERAL ARARs AND TBCs				
Clean Air Act National Ambient Air Quality Standards (NAAQS)	42 USC 7401, 40 CFR 50 and 52 Subpart O	ARAR	Regulates air emissions from area, stationary, and mobile sources This law authorizes the U.S. Environmental Protection Agency to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare and the environment.	Relevant and appropriate to remedial actions that include emissions to the atmosphere.
Clean Water Act [Federal Water Pollution Control Act, as amended]	40 CFR 122, 123, 125, 129, 131, 230, 233, 301-303,306, 307, 320-330, 401, 404; 33 USC 1251; 33 USC 1314	ARAR	Provides federal, state and local discharge requirements to control pollutants to navigable waters (also includes NPDES).	Establishes relevant and appropriate water quality criteria to protect against adverse effects.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings	40 CFR 192	ARAR	Provides relevant and appropriate cleanup standards for CERCLA sites contaminated with radionuclides.	Relevant to the management of thorium byproduct materials under Section 84 of the Atomic Energy Act of 1954, as amended, during and following processing of thorium ores, and to restoration of disposal sites. Is construed by EPA to set a standard for radium-22G and -228 of 5 pCi/g total radium above background (a standard of 7.2 pCi/g at the Kress Creek and Sewage Treatment Plant Sites).
Resource Conservation and Recovery Act (RCRA)	40 CFR 261, 262, 264, 268; 42 U.S.C. 6901 et seq.	ARAR	Identifies and lists certain materials as hazardous wastes and sets management standards for such wastes if encountered during cleanup.	Applicable to listed or hazardous or characteristic wastes encountered during cleanup of a site. Would not apply to thorium-contaminated soil or sediment that exhibits the "toxicity characteristic" merely because of the presence of elemental metals normally present in thorium ores.
STATE ARARs AND TBCs				
Illinois Uranium and Thorium Mill Tailings Control Act	420 ILCS 42	ARAR	Requires licensees to be prepared to decontaminate all properties that have been identified as being contaminated withby-product material produced at a licensed site.	Thorium mill tailings from the REF are found at the Sites.
Illinois Water Quality Standards, Water Pollution – Pollution Control Board	35 IAC, Subtitle C, 302-304,309	ARAR	Provides water quality standards applicable throughout the State, and maximum concentration of various contaminants which can be discharged. Also describes the NPDES and other associated permits.	Establishes relevant and appropriate water quality criteria to protect against edverse effects.
Illinois Environmental Protection – Pollution Control Board – Radiation Hazards	35 IAC, Subtitle I, Chapter I, Part 1000	ARAR	Establishes standards for protection against radiological air pollutants associated with materials and activities under licenses issued by the United States Nuclear Regulatory Commission pursuant to the Atomic Energy Act of 1954.	Establishes relevant and appropriate standards for radiological air pollutants that will be considered during development of the monitoring program during site cleanup.

TABLE 19
Chemical-Specific ARARs and TBCs
Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
STATE ARARs AND TBCs (CONT'D)				
Illinois Environmental Protection – Air Pollution – Toxic Air Contaminants	35 IAC, Subtitle B, Chapter I, Subchapter f, 232	ARAR	Establishes the procedures to identify a toxic air contaminant.	Establishes relevant and appropriate standards that will be considered during development of the monitoring program during site cleanup.
Licensing Requirements for Source Material Milling Facilities	32 IAC 332	ARAR	Establishes the procedural requirements and technical criteria applicable to the disposal of byproduct material and provides for the protection of the public health and safety during and after source material milling operations at the Kerr-McGee REF	Relevant and appropriate to the management of thorium byproduct materials at the Kress Creek and Sewage Treatment Plant Sites. Contains State equivalent to soil standards in 40 CFR 192.
Prohibition of Air Pollution	35 IAC, Subtitle B, 201.141	ARAR	Establishes that no person shall cause or threaten or allow the discharge or emission of any contaminant into the environment to cause air pollution, or to prevent the attainment or maintenance of any applicable ambient air quality standard.	Applicable to air emissions generated by equipment or activities during cleanup,
Illinois Radiation Protection Act of 1990	420 ILCS 40-13	ARAR	Requires licensees to complete decontamination of all properties identified as being contaminated with byproduct material from a licensed site.	Revelant and appropriate during remedial design and remedial action.
Radiation Protection of the Public and the Environment	rgy (DOE) Order 5400.5	TBC	Establishes standards and requirements for operations of the DOE with respect to protection of the public and environment against undue risk from remediation	The "as low as reasonably achievable" (ALARA) process would be considered in evaluating radiation dose limits for protection of the public and the environment.
Standards for Protection Against Radiation	10 CFR 20	TBC	Establishes that the total radiation dose to an individual (including doses resulting from licensed and unlicensed radioactive material and from radiation sources other than background radiation) do not exceed the standards for protection against radiation,	To be considered when implementing the ALARA approach.
ALARA Levels for Effluent from Materials Facilities	Regulatory Guide 8.37		Provides guidance on designing an acceptable program for establishing and maintaining ALARA levels for gaseous and liquid effluents at materials facilities.	To be considered when implementing the ALARA approach,
Termination of Operating Licenses for Nuclear Reactors	Regulatory Guide 1.86		Contains decontamination guides for the release of equipment for unrestricted use,	To be considered when establishing decontamination requirements associated with remediation.

TABLE 20

Action-Specific ARARs and TBCs

Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
			FEDERAL ARARs AND TBCs	
Clean Water Act [Federal Water Pollution Control Act, as amended]	Section 4040, and c) of the Clean Water Act, 33 USC 13440, and c); 40 CFR Part 230,231; 33 CFR Part 320-329	ARAR	Guidelines for Specification of Disposal Sites for Dredged or Fill Material. Except as otherwise provided under Clean Water Act Section 404(b)(2), no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have a less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. If there is no other practical alternative, impacts must be minimized. Includes criteria for evaluating whether a particular discharge site may be specified.	Applicable to all existing, proposed, or potential disposal sites for discharges of dredged or fill materials into U.S. waters, which include wetlands. Includes special policies, practices, and procedures to be followed by the U.S. Army Corps of Engineers in connection with the review of applications for permits to authorize the discharge of dredged or fill material into waters of the U.S. pursuant to Section 404 of the Clean Water Act.
Rivers and Harbors Act of 1899 (Section 10 Permit)	33 USC 403; 33 CFR Parts 320-330	ARAR	Prohibits unauthorized obstruction or alteration of any navigable water in the U.S. (dredging, fill, cofferdams, piers, etc.). The U.S. Army Corps of Engineers approval is generally required to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of the channel of any navigable water of the U.S.	Applicable to remedial activities that include dredging.
OSHA-Hazardous Waste Operations and Emergency Response	29 CFR 1910.120; 29 CFR 1904.2; 29 CFR 1910.1020	ARAR	Establishes health and safety requirements for cleanup operations at NPL sites.	OSHA requirements apply to all workers during cleanup operations at the Kress Creek and Sewage Treatment Plant NPL Sites.
Hazardous Materials Table, Special Provisions. Hazardous Materials Communications, Emergency Response Information, and Training Requirements	49 CFR 172.700	ARAR	Establishes training requirements for hazinat employees.	These requirements apply to the cleanup activities at the Kress Creek and Sewage Treatment Plant Sites.
Oil Pollution Prevention and Response; Non-Transpoitation-Related Onshore and Offshore Facilities	40 CFR I12	ARAR	Establishes requirements for Spill Prevention, Control, and Countermeasure (SPCC) Plans.	Applicable to site cleanup activities.

TABLE 20
Action-Specific ARARs and TBCs
Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
			FEDERAL ARARs AND TBCs (CONT'D)	
USDOT Placarding and Handling	49 CFR 171, 173	ARAR	Provides transportation and handling requirements for hazardous materials	Applies to hazardous mateiials that are removed and transported from the Sites.
Solid Waste Disposal Act, as amended	40 CFR 261-265,268	ARAR	Establishes a characteristic test of the presence of hazardous constituents at levels that could make remedial residues hazardous wastes, and establishes requirements for management, transport, and land disposal of such materials.	Applicable to remedial activities involving transport and disposal of material.
USEPA Remedial Design/Remedial Action Handbook		TBC	General reference manual that provides remedial project managers with an overview of the remedial design and remedial action processes.	This manual will be consulted during remedial design and remedial action.
USEPA Superfund Remedial Design and Remedial Action Guidance	OSWER Directive No. 9355.0-4A, June 1986	TBC	Guidance document developed to assist agencies and parties who plan, administer, and manage remedial design and remedial action at Superfund sites.	This guidance will be consulted during remedial design and remedial action.
			STATE ARARs AND TBCs	
Department of Nuclear Safety –Transportation of Radioactive Material	32 IAC, Chapter II, 341	ARAR	Establishes requirements for packaging, preparation for shipment and transportation of radioactive material and applies to any person who transports radioactive material or delivers radioactive material to a carrier for transport.	Applicable to remedial activities involving transport of inaterial.
Floodway Constiuction in Northeastern Illinois	17 IAC, Title 17, Chapter I, Part 3708	ARAR	Provides rules governing construction and filling in the regulatory floodway of rivers, lakes and streams of Cook, DuPage, Kane, Lake, McHenry and Will Counties, excluding the City of Chicago so that periodic inundation will not pose a danger to the general health and welfare of the user, require the expenditure of public funds, require the provision of public resources or disaster relief services, and result singularly or cumulatively in greater flood damages or potential flood damages due to increases in flood stage or velocities or loss of flood storage.	Applicable to the dredging work at the sites during cleanup activities.
Hazardous Material Transportation Regulations	IDOT Title 92, Chapter I, Subchapter C	ARAR	Designates the requirements of the Illinois Department of Transportation governing the transportation of hazardous wastes including discussion of carrying waste by highway and specifications for tank cars and packaging.	Applicable to remedial activities involving transport of hazardous inaterial.
Illinois Urban Manual	IEPA/USDA, NRCS; 1995	ARAR	Provides construction standards and specifications, material specifications, and standard drawings related.to urban ecosystem protection and enhancement.	Applicable to site cleanup activities.

TABLE 20
Action-Specific ARARs and TBCs
Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
STATE ARARs AND TBCs (CONT'D)				
Licensing Requirements for Land Disposal of Radioactive Waste	32 IAC 601	ARAR	Establishes procedures, criteria, and terms and conditions upon which the Department of Nuclear Safety issues licenses for tlie land disposal of radioactive wastes if such disposal is away from the point of generation or if such disposal is of waste which has been received from other persons.	Relevant and appropriate to cleanup activities at the Sites involving transportation of radioactive material for disposal.
Nuclear Safety – Uranium and Thorium Mill Tailings Control Act	420 ILCS 42	ARAR	Establishes a comprehensive program for the timely decommissioning of uranium and thorium mill tailing facilities in Illinois and for the decontamination of properties that are contaminated with uranium or thorium mill tailings (in addition to the regulatory program established in the Radiation Protection Act of 1990).	Applicable to remedial activities at sites contaminated by radioactive thorium from tlie REF.
Procedures and Criteria for Federal Permits or Licenses To Discharge Into Waters of lie State	35 IAC 395	ARAR	These rules state tlie procedures and criteria which the Illinois Environmental Protection Agency will use in certifying, under Section 401 of the Clean Water Act, that activities requiring federal permits of licenses will comply with Sections 301, 302, 202m 306, and 307 of the Clean Water Act.	Applicable to cleanup activities including dredging in Kress Creek and tlie West Branch DuPage River.
Regulation of Construction Within Floodplains	92 IAC, Part 708; 17 IAC, Title 17, Chapter I, Part 3706	ARAR	Provides protection of public health, safety, and general welfare by restricting damageable floodplain improvements and uses which increase flood damage potential elsewhere, The regulation is more specifically adopted to: - Protect adjacent, upstream, and downstream private and public landowners from increases in flood heights and velocities and resulting increases in flood damage; - Minimize extraordinary direct/indirect costs to governmental units caused by developments within flood plains for roads, sewer and water, flood control works, flood relief and emergency services; - Reduce health and safety risks to the individual, family or guests, prevent blighting, and prevent economic losses detracting from community well-being and the tax base; - Protect individuals from buying lands which are unsuited for intended purposes because of flood hazard; and - Prevent water pollution, nuisances due to floating structures/debris, and increased sedimentation.	Applicable to tlie cleanup activities in floodplains along Kress Creek and the West Branch DuPage River.
Rivers, Lakes, and Streams Act	615 ILCS (1996 State Bar Edition)	ARAR	Regulates construction activities in floodplains with a focus on preserving tlie hydrological integrity of the state's public waters.	Applicable to the cleanup activities in floodplains along Kress Creek and the West Branch DuPage River.
Environmental Protection – Pollution Control Board – Waste Disposal – Site Remediation Program	35 IAC, Subtitle *G*, Chapter I, Part 740	TBC	Establishes procedures for the investigative and remedial activities at sites where there is a release; threatened release, or suspected release of hazardous substances, pesticides, or petroleum and for the review and approval of those activities.	To be considered during investigation and cleanup of the Kress Creek and STP Sites.

TABLE 20
Action-Specific ARARs and TBCs
Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
			STATE ARARs AND TBCs (CONT'D)	
Rules for Regulation of Public Waters	92 IAC, Part 704; 17 IAC, Title 17, Chapter I, Part 3704	ARAR	Provides protection of the public's interest, rights, safety and welfare in the State's public bodies of water. More specifically, construction will be regulated to prevent obstruction to, or interference with, the navigability of any public body of water; encroachment on any public body of water; and impairment of the rights, interests or uses of the public in any public body of water or in the natural resources thereof.	Applicable to dredging activities in Kress Creek and the West Branch DuPage River.
Standards and Specifications for Soil Erosion and Sediment Control	IEPA/WPC/87-012	ARAR	Provides standards and specifications for design and construction of erosion control measures.	Constmction activities should be planned and constructed in accordance with the specifications outlined in the Illinois Urban Manual, especially as it relates to erosion control measures.
Transportation of Radioactive Material	32 IAC 341	ARAR	Establishes requirements for packaging, preparation for shipment and transportation of radioactive material and applies to any person who transports radioactive material or delivers radioactive material to a carrier for transport.	Applicable to remedial activities involving transport of thorium-contaminated material.
Standards for Protection Against Radiation	32 IAC 340	ARAR	Establishes standards for protection against radiation during receipt, possession, use, transfer, and disposal of radiation sources.	Applicable to site activities involving handling, transportation and disposal of thorium-contaminated material.
Waste Disposal – Pollution Control Board	35 IAC, Subtitle G, 721-722, 724, 728, 807-809	ARAR	Includes the Identification And Listing Of Hazardous Waste, Standards Applicable To Generators Of Hazardous Waste, Standards For Owners And Operators Of Hazardous Waste Treatment, Storage, And Disposal Facilities, Land Disposal Restrictions, Special Waste Classifications, and Nonhazardous Special Waste Hauling and the Uniform Program. The regulations identify those solid wastes which are subject to regulation as hazardous wastes; establish standards for generators of hazardous waste; identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be land disposed; provides a means by which persons may obtain a classification or declassification of special (non-RCRA) waste based on the degree of hazard of the waste or other characteristics, to assure that the waste receives appropriate handling; and prescribes the procedures for the Uniform Hazardous Materials Transportation and Registration Program and for the issuance of permits to nonhazardous special waste transporters; for the inspection and numbering of vehicles; and for proper management and transportation of solid and non-hazardous special wastes to approved disposal, storage and treatment sites.	Portions are applicable and portions are relevant and appropriate to remedial activities involving handling and disposal of hazardous and special wastes.
Flood Control Act	ILCS 14-28-1	ARAR	Requires formal approval for any offsite construction, excavation or filling in the floodwav.	Would be relevant and appropriate if any remedial work is conducted offsite.

TABLE 20
Action-Specific ARARs and TBCs
Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
		LOCAL TBCs		
DuPage County Countywide Stormwater and Floodplain Ordinance	Ordinance No. OSM-0001-89	TBC	Required for development (i.e., excavation or fill, alteration, change in land use, or activities affecting stormwater discharge) that affects both a floodplain/riparian area and a wetland.	The cleanup work will take place in floodplains, riparian areas and wetlands.
DuPage County Right of Way Permit, License and Fee Ordinance	Ordinance No. ODT-0007-97	TBC	Applies to any work conducted within County designated highway routes including storm sewer, sanitary sewer, water main, residential/commercial, left/right turn widening, sidewalk, grading, landscaping, street lighting, signage, traffic signals, parades, temporary road closures/detours, etc.	Would apply during activities involving use of County designated highway routes
Kane/DuPage County Erosion and Sediment Control Plan Application	Condition of Section 404 Clean Water Act Permit Issuance – DuPage County signed Memorandum of Understanding on 6/12/97	TBC	Requires appropriate soil erosion and sediment control measures to be impleinented and maintained until the construction site is vegetated and stabilized.	Applies to cleanup activities that inay adversely affect water quality by causing soil erosion into surface waters or disturbing sediments.

TABLE 21

Location-Specific ARARs and TBCs

Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
FEDERAL ARARs AND TBCs				
Endangered Species Act	16 USC 1531-1544; 50 CFR Part 17, Subpart I; 50 CFR Part 402	ARAR	Federal agencies are required to verify that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of a critical habitat of such species, unless such agency has been granted an appropriate exemption by the Endangered Species Committee (16 USC § 1536).	Some threatened or endangered species are known to exist in the general project area of DuPage County, but none have been identified at the Sites. This regulation woiuld apply if any threatened or endangered species were identified at the Sites.
Fish and Wildlife Coordination Act	16 USC. 661-666	ARAR	Whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose, by any department or agency of the United States, such department or agency first shall consult with the United States Fish and Wildlife Service, Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular State in which the impoundment, diversion, or other control facility is to be constructed, with a view to the conservation of wildlife resources by preventing loss of and damage to such resources.	These requirements apply to the Site cleanups which involve controlling and diverting water in Kress Creek and the West Branch DuPage River.
National Environmental Policy Act (NEPA)	42 USC Sect 4321 et. seq.; 40 CFR Sect. 6 Subpart C; 23 CFR 771	ARAR	Establishes the broad national framework for protecting our environment and assures that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment. Requirements are invoked when airports, buildings, military complexes, highways, parkland purchases, and other federal activities are proposed. Environmental Assessments (EAs) and Environmental Impact Statements (EISs), which are assessments of the likelihood of impacts from alternative courses of action, are required from all Federal agencies and are the most visible NEPA requirements.	NEPA requires the USACE to conduct an Environmental Assessment to determine whether an EIS is required. An EIS is required for "major federal activities significantly affecting the environment." This process is generally performed concurrent with the review of the Section 404 permit (potentially via tlie joint application process). The remedial investigation and feasibility study is functionally equivalent to the EIS because it examines the impacts of the various cleanup alternatives.
Preservation of Historical and Archaeological Data Act and National Historic Preservation Act (NHPA)	16 USC 469; 36 CFR Parts 60, 63, 65; 16 USC 470; 36 CFR Part 800; EO 11593	ARAR	Establishes requirements for the recovery and preservation of historical and archaeological data. Also requires measures to minimize harm to historic resources. Response actions must take into account effects on properties on or eligible for inclusion on the National Registry of Historic Places. Federal agencies are required to locate, inventory, and nominate to the National Register of Historic Places all properties under their jurisdiction or control that appear to qualify for listing in the National Register.	These recovery and preservation requirements apply if historical or archaeological resources are encountered. No such resources have been encountered in the studies performed at the Sites to date.

TABLE 21

Location-Specific ARARs and TBCs

Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
			FEDERAL ARARs AND TBCs (CONT'D)	
Statement of Procedures on Floodplain Management and Wetland Protection	44 CFR Part 9	ARAR	Sets forth EP policy and ance for car ing out Executive Orders 11990 and 11988. Executive Order 11988: Floodplain Management requires federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain. Federal agencies are required to avoid adverse impacts or minimize them if no practicable alternative. Executive Order 11990: Protection of wetlands requires federal agencies conducting certain activities to avoid, to the extent possible, adverse impacts associated with the destruction or loss of wetlands if a practicable alternative exists. Federal agencies are required to avoid adverse impacts or minimize them if no practicable alternative exists.	These directives are relevant and appropriate because the removal of contaminated sediments and soils will affect floodplains and wetland areas.
Mitigation of Impacts to Wetlands and Natural Habitat	23 CFR 777	TBC	Establishes procedures for the evaluation and mitigation of adverse environmental impacts to wetlands and natural habitat resulting from Federal-aid projects.	Although not a Federally-aided project, would be considered in the wetlands evaluation and mitigation.
EPA Office of Solid Waste And Emergency Response - Policy of Floodplains and Wetland Assessments for CERCLA Actions, August 1985		TBC	This memorandum discusses situations that require preparation of a floodplains or wetland assessment, and the factors that should be considered in preparing an assessment, for response actions taken pursuant to Section 104 or 106 of CERCLA.	Will be consulted with respect to any floodplains or wetlands assessments that need to be performed.
			STATE ARARs AND TBCs	
Illinois Endangered Species Protection Act	520 ILCS 10 (1994 State Bar Edition)	ARAR	It is unlawful for any person to possess, take, transport, sell, offer for sale, give or otherwise dispose of any animal or the product thereof of any animal species which occurs on the Illinois List, or to deliver, receive, carry, transport or ship in interstate or foreign commerce plants listed as endangered by the Federal government without a permit, and to take plants on the Illinois list without the expressed written permission of the landowner or to sell or offer for sale plant or plant products of endangered species on the Illinois list.	Some threatened or endangered species are known to exist in the general project arc DuPage County, but none have been identified at the Sites. This regulation woiuld apply if any threatened or endangered species were identified at the Sites.

TABLE 21

Location-Specific ARARs and TBCs

Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Regulation	Citation	ARAR or TBC	Description	Rationale
			STATE ARARs AND TBCs (CONT'D)	
Illinois Environmental Protection Act	415 ILCS 5	ARAR	It is the purpose of this act to establish a unified, state-wide program supplemented by private remedies, to restore, protect and enhance the quality of the environment, and to assure that adverse effects upon the environment are fully considered and borne by-those who cause them.	These requirements are relevant and appropriate to the cleanup of the Kress Creek and STP Sites.
Illinois State Agency Historic Resources Preservation Act	20 ILCS 3420, as amended, 17 IAC 41SO	ARAR	Requires an assessment of all state funded, permitted or licensed work to determine whether prehistoric or historic cultural resources are present within the project area. If probability of archaeological resources present within the project area, an archaeological survey would be required.	These recovery and preservation requirements apply if historical or archaeological resources are encountered. No such resources have been encountered in the studies performed at the Sites to date.
Interagency Wetland Policy Act of 1989	20 ILCS 830	ARAR	Directs that the State Agencies shall preserve, enhance, and create wetlands where possible and avoid adverse impacts to wetlands in order to maintain the economic and social values of the State's remaining wetlands.	This directive is relevant and appropriate because the removal of containinated sediments and soils will affect floodplains and wetland areas.
			LOCAL TBCs	
An Ordinance Establishing Rules and Regulations for the Granting of Easements and Licenses by the Forest Preserve District of DuPage County and Providing for the Partial Repeal of Ordinance No. 9-22	Ordinance No. 96-096	TBC	This Ordinance establishes rules and regulations governing granting of easements and licenses by the District to protect and preserve the property, natural areas, forests, trees, vegetation, wildlife, scenic beauties, natural resources, flora and fauna, facilities, and improvements of the District.	To be considered with respect to Forest Preserve District Land at the Sites.

TABLE 22

Alternative 3: Summary of Preliminary Material Volume Estimates

Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites

Geographic Location	Estimated Volume (cubic yards)						
	Sediment Materials		Floodplain Materials		Total		Total
	Targeted Material	Overburden Material	Targeted Material	Overburden Material	Targeted Material	Overburden Material	(Rounded)
Kress Creek: Outfall to May Street	1,700	500	5,000	1,400	6,700	1,900	9,000
Kress Creek: May Street to Joy Road	3,900	1,000	3,600	900	7,500	1,900	9,000
Kress Creek: Joy Road to Route 59	700	100	6,200	1,100	6,900	1,200	8,000
Kress Creek: Route 59 to Confluence	100	100	3,200	400	3,300	500	4,000
West Branch DuPage River: STP to Confluence	200	100	2,000	1,000	2,200	1,100	3,000
West Branch DuPage River: Confluence to Williams Road	1,000	600	11,200	7,100	12,200	7,700	20,000
West Branch DuPage River: Williams Road to Butterfield Road	700	900	1,300	1,600	2,000	2,500	5,000
West Branch DuPage River: Butterfield Road to Warrenville Dam	24,500	15,500	1,300	800	25,800	16,300	42,000
West Branch DuPage River: McDowell Grove Area	10,000	14,700	0	0	10,000	14,700	25,000
Rounded Total:	43,000	34,000	34,000	14,000	77,000	48,000	125,000

Notes:

1. Total surface areas were calculated by summing surface areas (obtained from ArcView) for all individual areas within a specified reach, Volumes were calculated using the average depth of overburden and targeted material provided for all boreholes within each area and multiplying by the total surface area.
2. Volumes were further separated by sediment or floodplain based on the percent of total surface area for each reach that exists within or outside of the Creek/River boundary.
3. The areal extent of targeted material is illustrated on Figure 2-1 of the FS Report.
4. Kerr-McGee is performing additional characterization (i.e., surface scanning and if necessary. downhole drilling) in specific areas of the Sites, including the stretch of the River between the Warrenville and McDowell Dams. Volumes provided in this document do not take into account this future characterization, and therefore may require modification based on the results of the additional characterization work.
5. The reach entitled "West Branch DuPage River: STP to Confluence" represents the river portion of the STP Site; all other reaches are part of the Kress Creek Site.

TABLE 23

Preliminary Cost Estimate for Alternative 3: Excavation and Off-Site Disposal of Targeted Sediment/Soil Throughout the Site

Sewage Treatment Plant Site - River OU

ITEM NO.	DESCRIPTION	UNIT	NO. OF UNITS	UNIT COST	ESTIMATED COST
1	General Expenses	LS	1	$300,000	$300,000
2	Pre-Design Investigations	LS	1	$30,000	$30,000
3	Site Preparation	LS	1	$50,000	$50,000
4	Temporary Sedimentation and Erosion Control Area for Filtering	LS	1	$15,000	$15,000
5	Dewatering System	LS	1	$150,000	$150,000
6	Overburden Excavation/Staging (River Sediments and Floodplain Materials)	CY	1,100	$20	$22,000
7	Targeted Sediment Excavation/Staging/Transport and Disposal	CY	200	$315	$63,000
8	Targeted Floodplain Material Removal/Staging/ Transport and Disposal	CY	2,000	$275	$550,000
9	Sediment Stabilization	TON	300	$25	$7,500
10	Material Loading	CY	2,200	$15	$33,000
11	Backfill	CY	2,000	$15	$30,000
12	Site Restoration	LS	1	$50,000	$50,000
13	Construction Monitoring/Oversight	MO	2	$30,000	$60,000
				Construction Total:	$1.4 M
				Engineering Design:	$0.07 M
				Contingency:	$0.27 M
				Long-Term Monitoring/O&M Program (Present Worth):	$0.06 M
				Total:	$1.8 M

See assumptions on Page 2.

TABLE 23 (continued)

Preliminary Cost Estimate for Alternative 3:
Excavation and Off-Site Disposal of Targeted Sediment/Soil throughout the Site

Sewage Treatment Plant Site - River OU

General Assumptions:

1. Under this alternative, excavation activities would be performed using mechanical excavation techniques within discrete manageable reaches. Targeted areas would be isolated or contained using silt curtains, sand bags, earthen berms, and/or sheetpiling, as appropriate, and dewatered to allow excavation in the dry. Complete excavation of overburden and targeted materials would be performed in a stepwise manner upstream to downstream within the discrete reaches prior to moving to the next reach. At each location, overburden materials would be excavated first, followed by targeted material.
2. Work to be conducted 6 days per week.
3. All costs are provided in 2004 dollars and all capital cost expenditures are assumed to occur in 2004.
4. Costs do not include property costs (if necessary), access costs (if necessary), permitting costs, legal fees, Agency oversight, and public relations efforts.
5. Engineering and design fees estimated at 5% of construction and restoration costs (i.e., construction monitoring/oversight and transportation and off-site material transportation and disposal costs are not included).
6. A 20% contingency fee has been included to account for unforeseen circumstances or variability in volumes, labor, or material cost.

Specific Assumptions:

1. The line item for general expenses includes the following components (the approximate percentage of the total line item cost that is associated with each component is provided in parenthesis): mobilization/demobilization along with decontamination of equipment (5%), temporary facilities and installation of electrical systems (5%), health and safety (20%), surveying (5%), radiological testing (1%), taxes (5%), and contractor overhead (25%), and expenses and other fees such as indirect job labor, general expenses, and profit (34%).
2. Pre-design investigations would be performed prior to implementation of remedial activities.
3. Site preparation activities include clearing and grubbing, and construction of access and haul roads. During clearing and grubbing, all trees and brush located within areas required to complete excavation activities would be cleared. Chipped trees and stumps would be left on site. Access and haul roads would be constructed to a width of approximately 16 feet using geotextile (and/or geogrid in soft areas) and stone. Staging areas would be constructed using a liner, geotextile and stone, asphalt, and would be bermed around the perimeter for containment. The approximate breakdown of the total line item estimated cost is as follows: 5% for clearing and grubbing, 60% for construction of access and haul roads, and 35% for construction of staging areas.
4. The temporary sedimentation and erosion control area for filtering would include construction of a water filtering system and placement of silt curtains to mitigate migration of suspended solids during construction. The temporary sedimentation control system is assumed to consist of sand and carbon filters, polymer system, pumps, and a storage tank. A silt curtain would be installed downstream of the work areas and anchored into shore. Approximately 95% of the total estimated line item cost is for construction and operation of the water filtering system with the remaining 5% comprised of silt curtain purchase and installation.
5. The assumed dewatering system for the River would include either a pump bypass system including a dewatering pump and pipe along with sheetpiling, earthen berms, silt curtains, and/or sand bags as appropriate or a sheetpile diversion system along with excavation dewatering sumps/piping, as appropriate. Both of these systems would include two different dewatering components - dewatering the River area targeted for excavation and dewatering excavated materials (via gravity drainage at the staging area). Note the actual diversion method will be determined during detailed design. The lump sum cost is comprised of 45% for dewatering associated with construction and operation of the required pump bypass systems and 55% for dewatering associated with the required sheetpile diversion systems.
6. All overburden materials from the River bed and floodplain areas have been assumed to be excavated through the use of backhoes at a rate of 400 cubic yards per day (cy/day). Materials would be loaded and transported to the on-site staging area, where they would be staged for future use as backfill.
7. All targeted sediment materials have been assumed to be excavated through the use of backhoes at a rate of 200 cy/day. Materials would be loaded and transported to the on-site staging area, where they would be staged for off-site disposal. Off-site material transportation and disposal includes disposal of excavated targeted sediment and stone in direct contact within the materials requiring disposal. Includes trucking to trans-shipment point, railcar loading, rail shipping, and disposal.
8. All targeted floodplain materials have been assumed to be excavated through the use of backhoes at a rate of 400 cy/day. Materials would be loaded and transported to the on-site staging area, where they would be staged for off-site disposal. Off-site material transportation and disposal includes disposal of excavated targeted soil material and stone in direct contact within the materials requiring disposal. Includes trucking to trans-shipment point, railcar loading, rail shipping, and disposal.

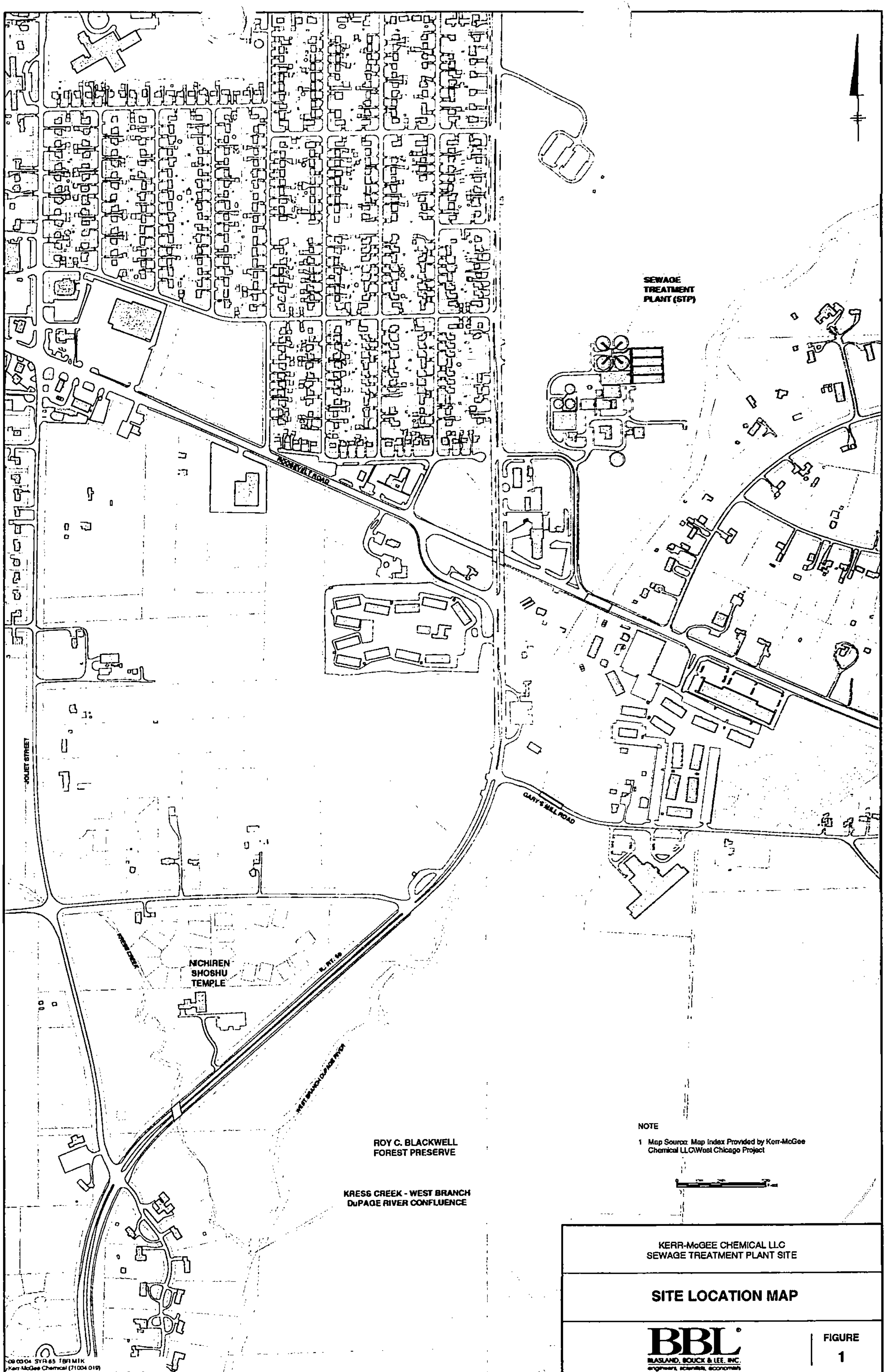
TABLE 23 (continued)

Preliminary Cost Estimate for Alternative 3:
Excavation and Off-Site Disposal of Targeted Sediment/Soil throughout the Site

Sewage Treatment Plant Site - River OU

9. It has been assumed that sediment materials requiring off-site disposal would be stabilized through the use of quicklime (15% by weight would be added). Sediment and quicklime would be blended at the on-site staging areas with a backhoe. The tonnage provided represents the weight of sediment including the additive tonnage of quicklime.
10. All materials requiring off-site disposal would be loaded from the staging area with a backhoe into dump trucks for transport to a disposal transfer station. It is assumed that the material would be handled a second time at the transfer station for loading for off-site disposal.
11. Excavated bank and floodplain areas would be backfilled to original grades with a combination of overburden material and materials available locally (assumed available in sufficient quantity) using a front end loader. The backfilled areas would be graded with a bulldozer. Select sediment areas would be filled within 2 feet of original grade using overburden or imported fill materials to maintain stability where deep excavations may exist.
12. All disturbed areas in the floodplain would be appropriately restored and revegetated to the extent practicable based on location characteristics (i.e., high or low energy aquatic environment, floodplain, residential, or forest preserve areas) and considering pre-remedial conditions. The restoration lump sum line item is comprised of the following breakdown: 45% for streambanks, 10% for residential/commercial properties, and 45% for forest preserves.
13. Construction monitoring and oversight would include daily oversight of all construction activities and air and water column monitoring.
14. The long-term monitoring/operation and maintenance program is assumed to include an annual monitoring and maintenance period for wetlands and other areas (i.e., forested uplands, low and high energy stream banks) for 3 years, and maintenance of residential/commercial areas for 1 year. The estimated cost for the long-term monitoring program was calculated using the present worth analysis process outlined by the USEPA (July 2000). A discount rate of 7% was used for the present worth calculation.

FIGURES



NOTE

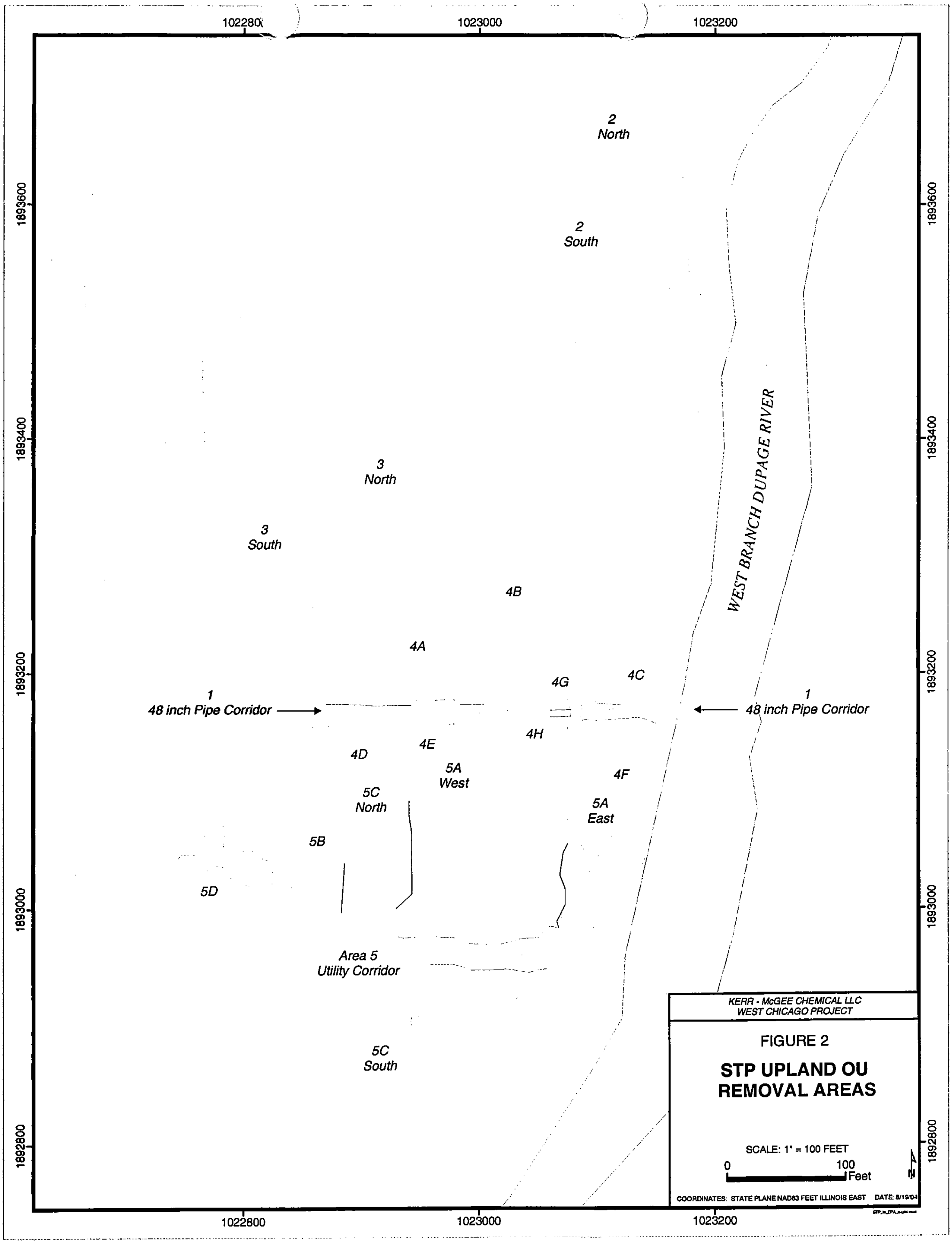
1 Map Source: Map Index Provided by Kerr-McGee Chemical LLC\West Chicago Project

KERR-McGEE CHEMICAL LLC
SEWAGE TREATMENT PLANT SITE

SITE LOCATION MAP

BBL
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

FIGURE
1

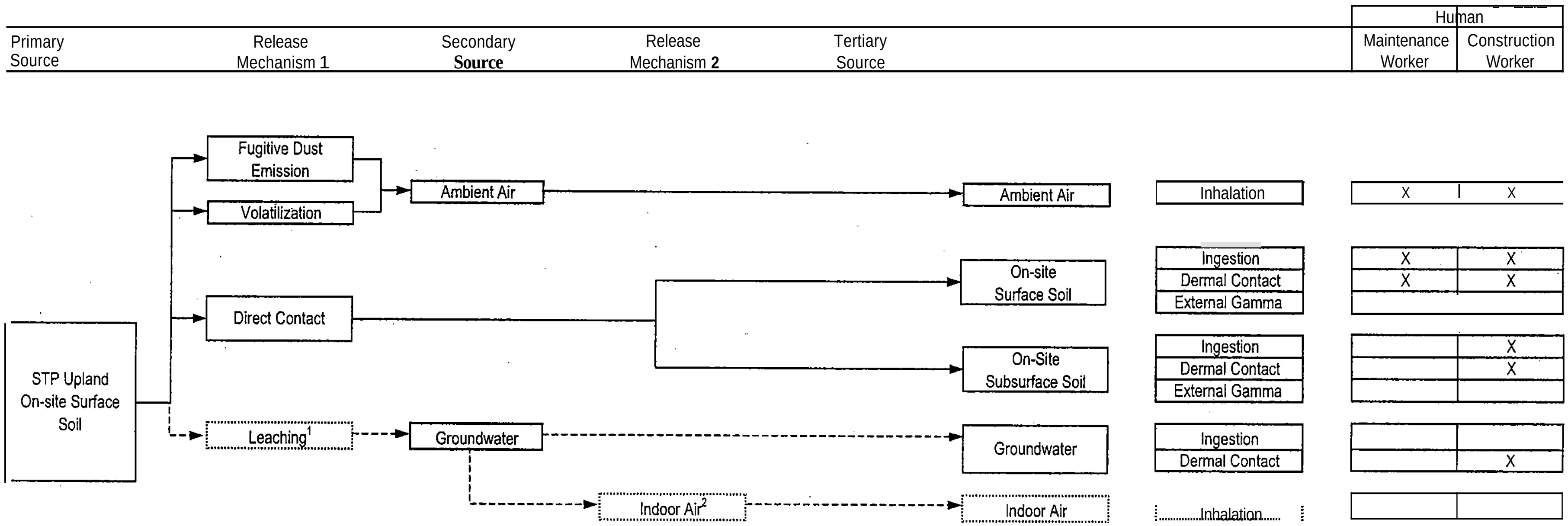


1022800
1023000
1023200
1893600
1893400
1893200
1893000
1892800
2
North
2
South
3
North
3
South
4B
4A
4G
4C
1
48 inch Pipe Corridor
1
48 inch Pipe Corridor
4H
4E
4D
5A
West
4F
5C
North
5A
East
5B
5D
Area 5
Utility Corridor
5C
South
WEST BRANCH DUPAGE RIVER
KERR - McGEE CHEMICAL LLC
WEST CHICAGO PROJECT
FIGURE 2
STP UPLAND OU
REMOVAL AREAS
SCALE: 1" = 100 FEET
0
100
Feet
COORDINATES: STATE PLANE NAD83 FEET ILLINOIS EAST
DATE: 8/19/04

FIGURE 3

Conceptual Site Model, Human Health Risk Assessment, STP Upland OU

Kerr-McGee Sewage Treatment Plant Site



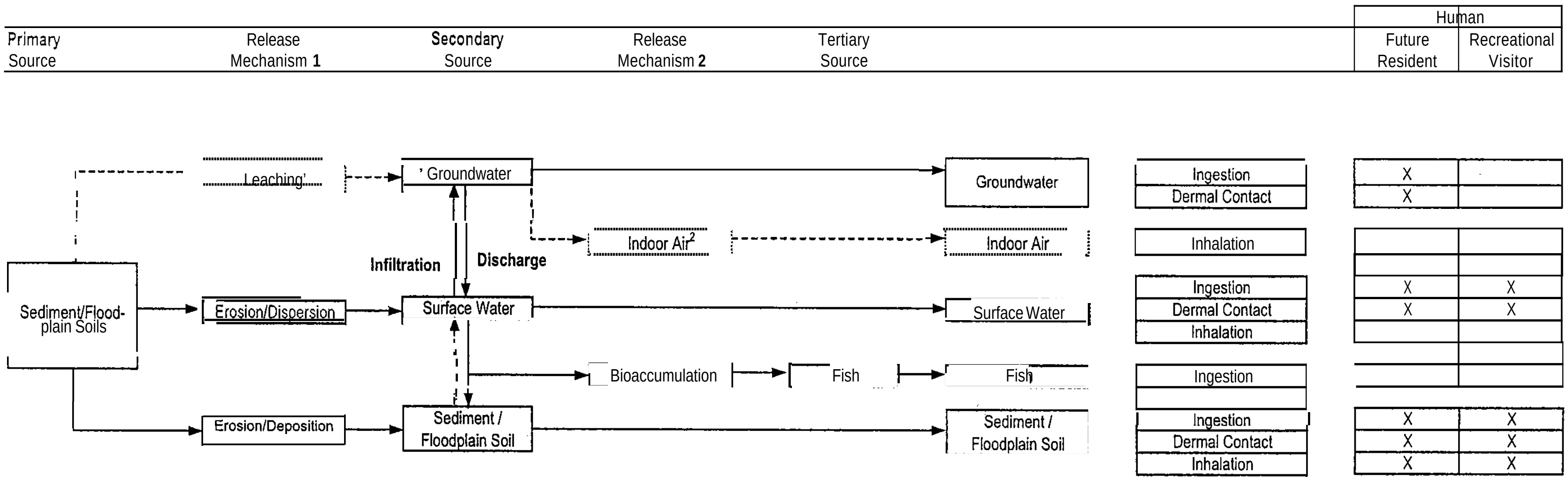
Note:
X - Potentially complete exposure pathways (quantitatively evaluated).
O - Potentially complete exposure pathways (qualitatively evaluated).
- - - Dashed lines indicate theoretically complete exposure pathway but may not be significant.

[1] Leaching from STP upland on-site soil to groundwater is not considered significant transport mechanism.
'Small number of volatile constituents were detected in groundwater, indicating volatilization from groundwater to indoor air may not be significant

FIGURE 4

Conceptual Site Model, Human Health Risk Assessment, STP River OU

Kerr-McGee Sewage Treatment Plant Site



Note:
X - Potentially complete exposure pathways (quantitatively evaluated).
O - Potentially complete exposure pathways (qualitatively evaluated).
- - - Dashed lines indicate theoretically complete exposure pathway but may not be significant.

[1] Leaching from sediment/floodplain soil to groundwater is not considered significant transport mechanism.
[2] Small number of volatile constituents were detected in groundwater, indicating volatilization from groundwater to indoor air may not be significant.

FIGURE 5
Conceptual Site Model, Ecological Risk Assessment, **STP** Upland OU, Radionuclides

Kerr-McGee Sewage Treatment Plant Site

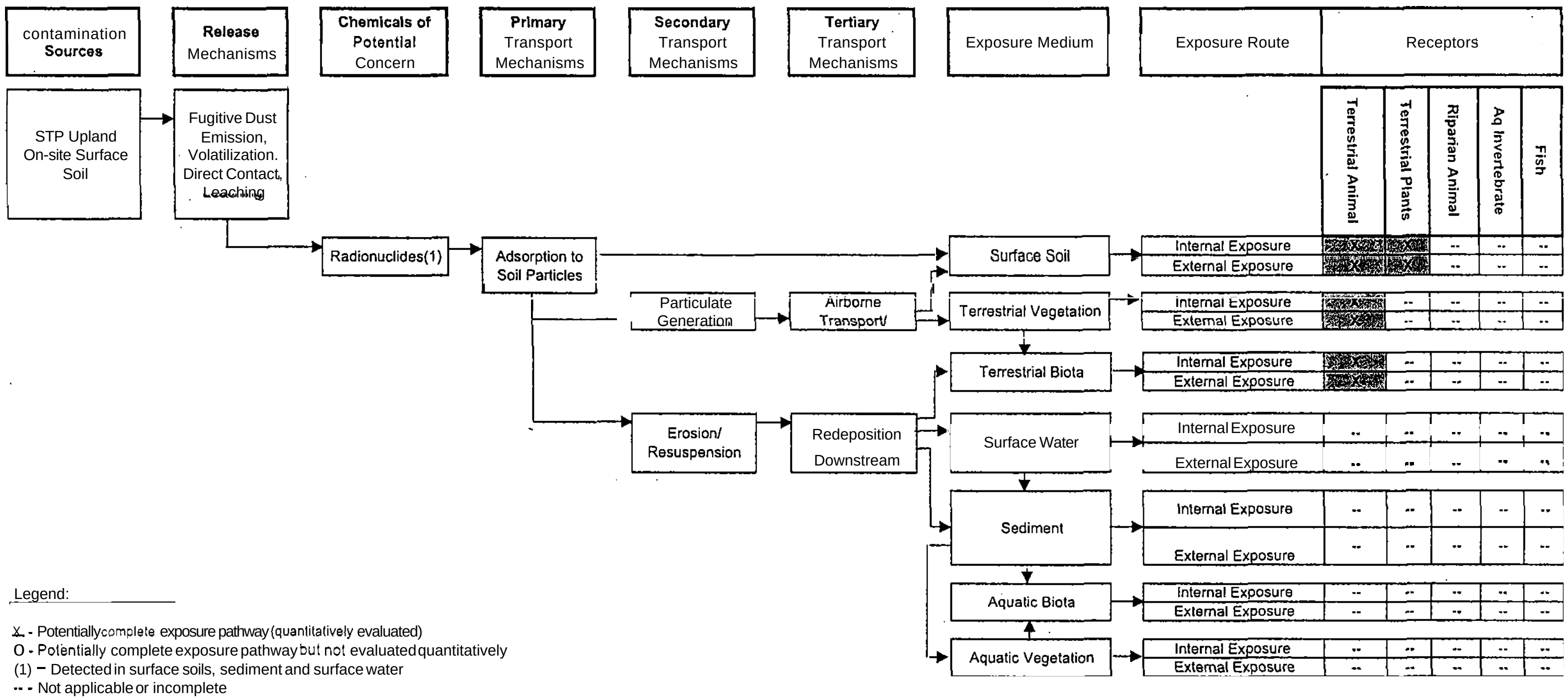
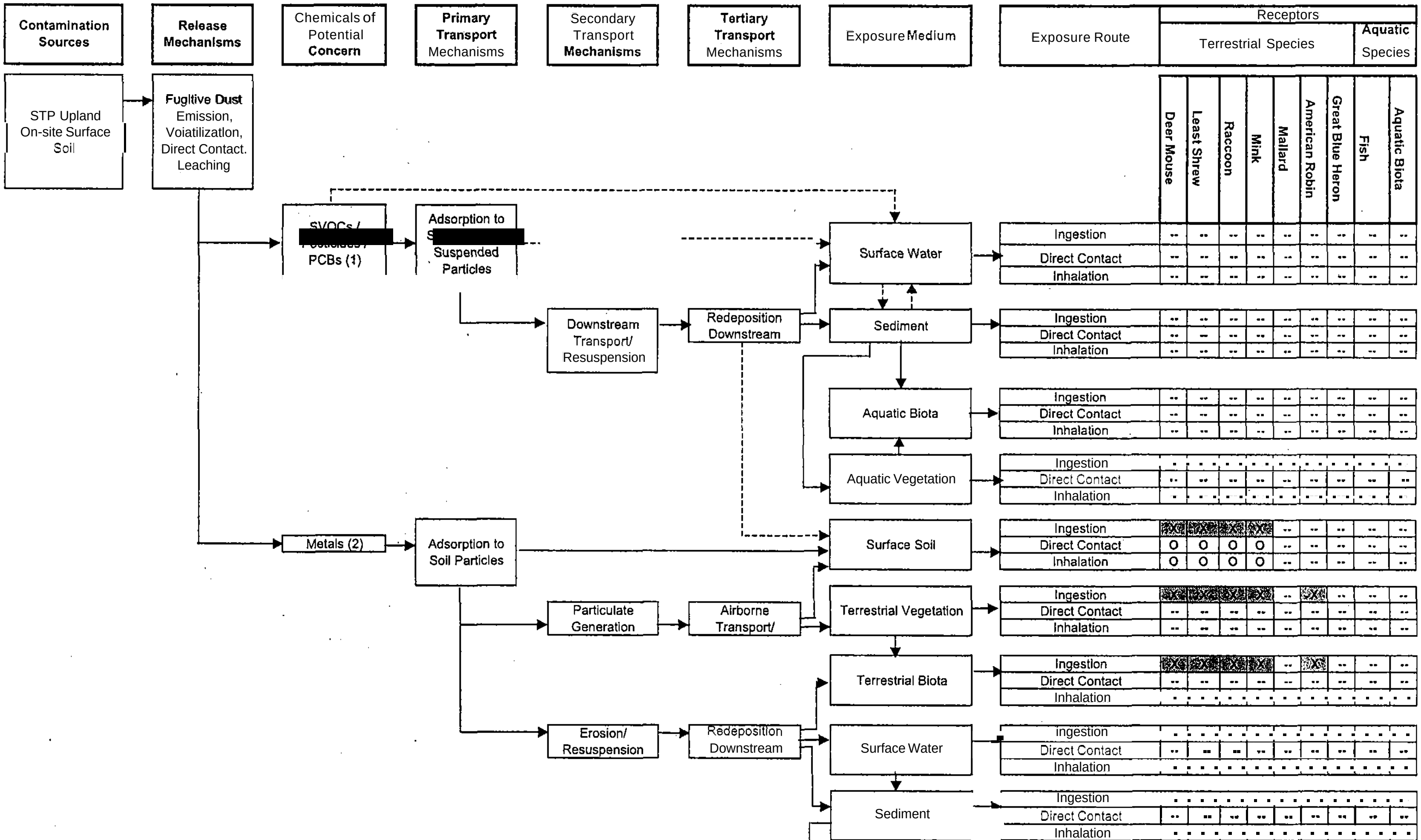


FIGURE 6

Conceptual Site Model, Ecological Risk Assessment, **STP** Upland **OU**, Chemicals

Kerr-McGee Sewage Treatment Plant Site



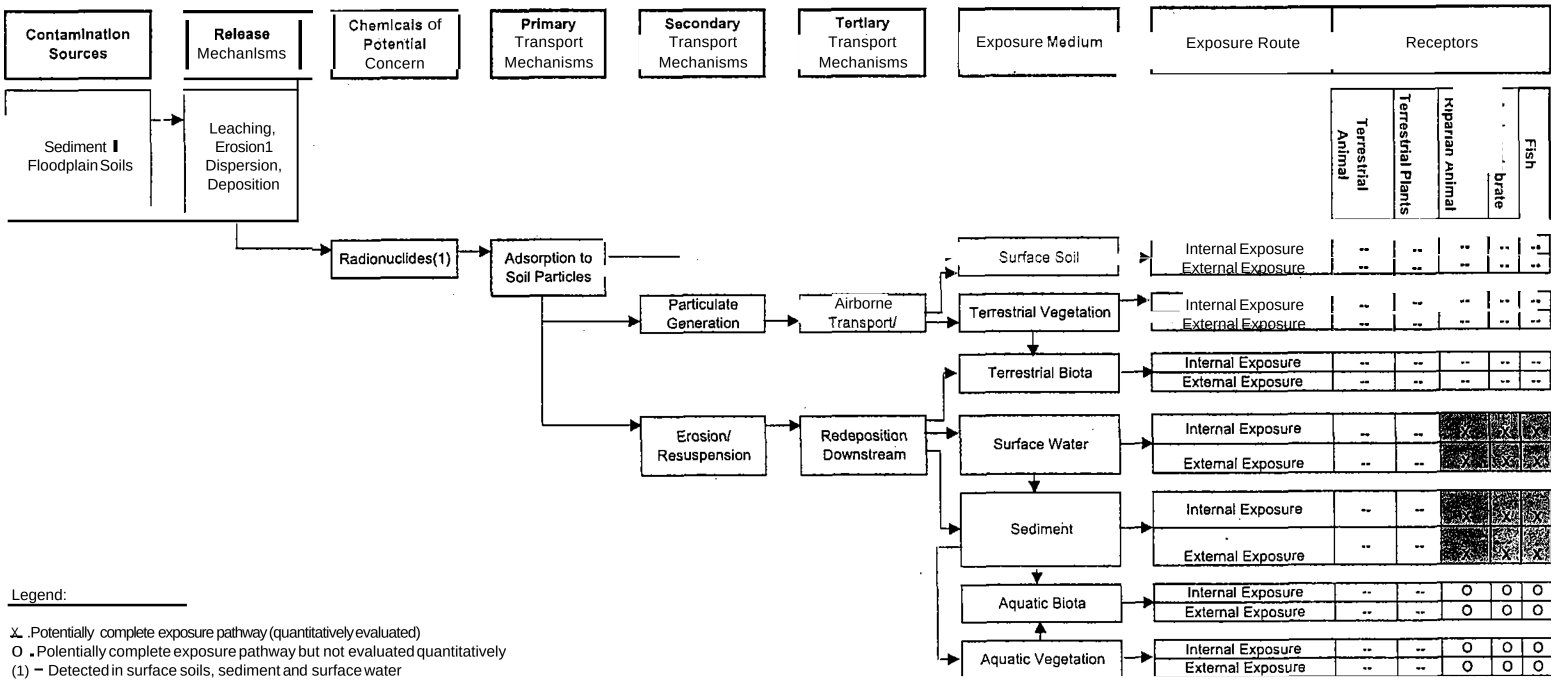
Legend:

X - Potentially complete exposure pathway (quantitatively evaluated)
O - Potentially complete exposure pathway but not evaluated quantitatively
-- - Not applicable or incomplete
(1) – Detected in sediments only (not analyzed far in soils and surface water)
(2) – Detected In surface soils, sediment and surface water
Dashed lines indicate theoretically complete pathways but unanalyzed media

FIGURE 7

Conceptual Site Model, Ecological Risk Assessment, STP River OU, Radionuclides

Kerr-McGee Sewage Treatment Plant Site



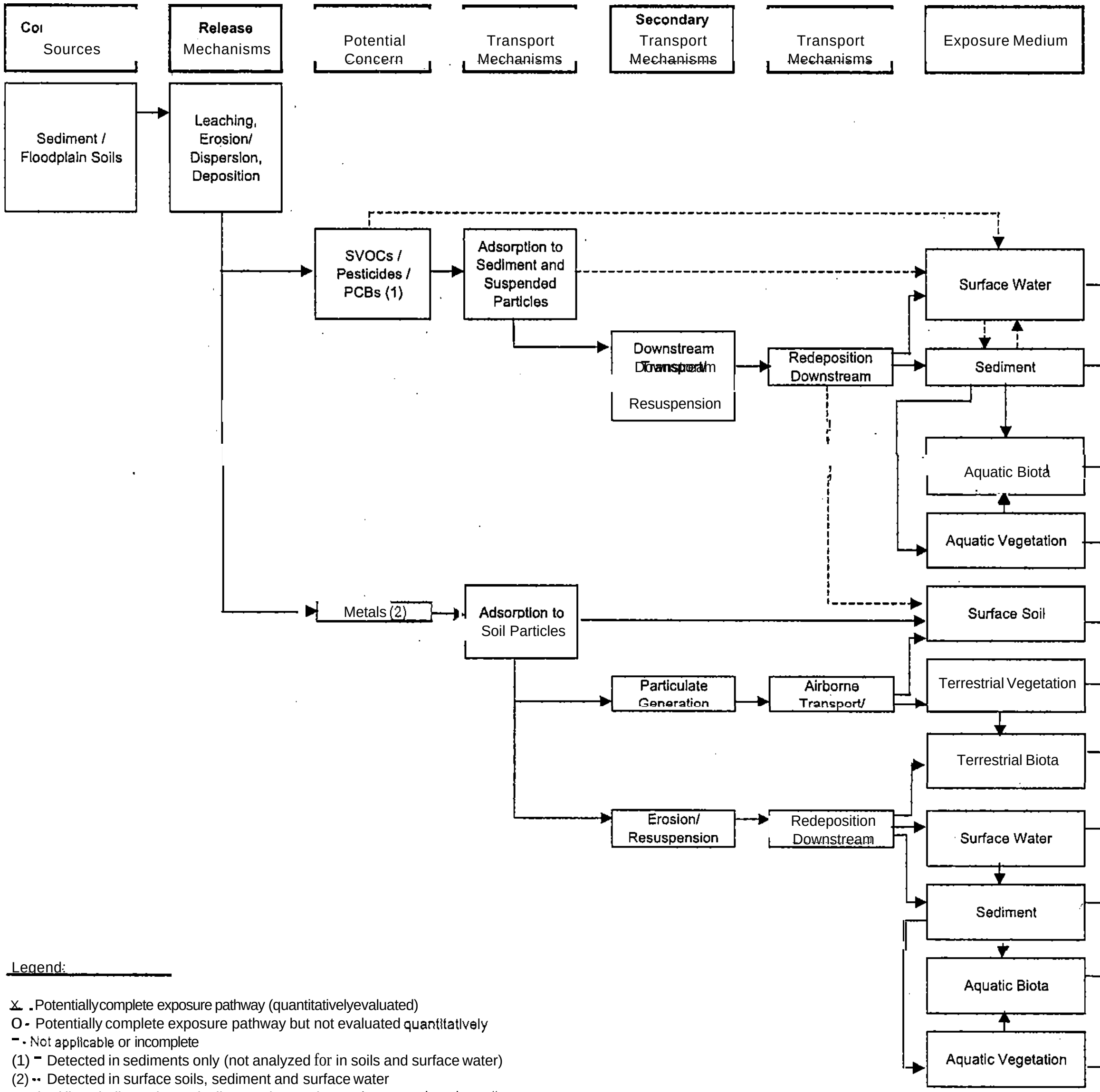
Legend:

X .Potentially complete exposure pathway (quantitatively evaluated)
O .Polentially complete exposure pathway but not evaluated quantitatively
(1) – Detected in surface soils, sediment and surface water
-- .Not applicable or incomplete

FIGURE 8

Conceptual Site Model, Ecological Risk Assessment, STP River OU, Chemicals

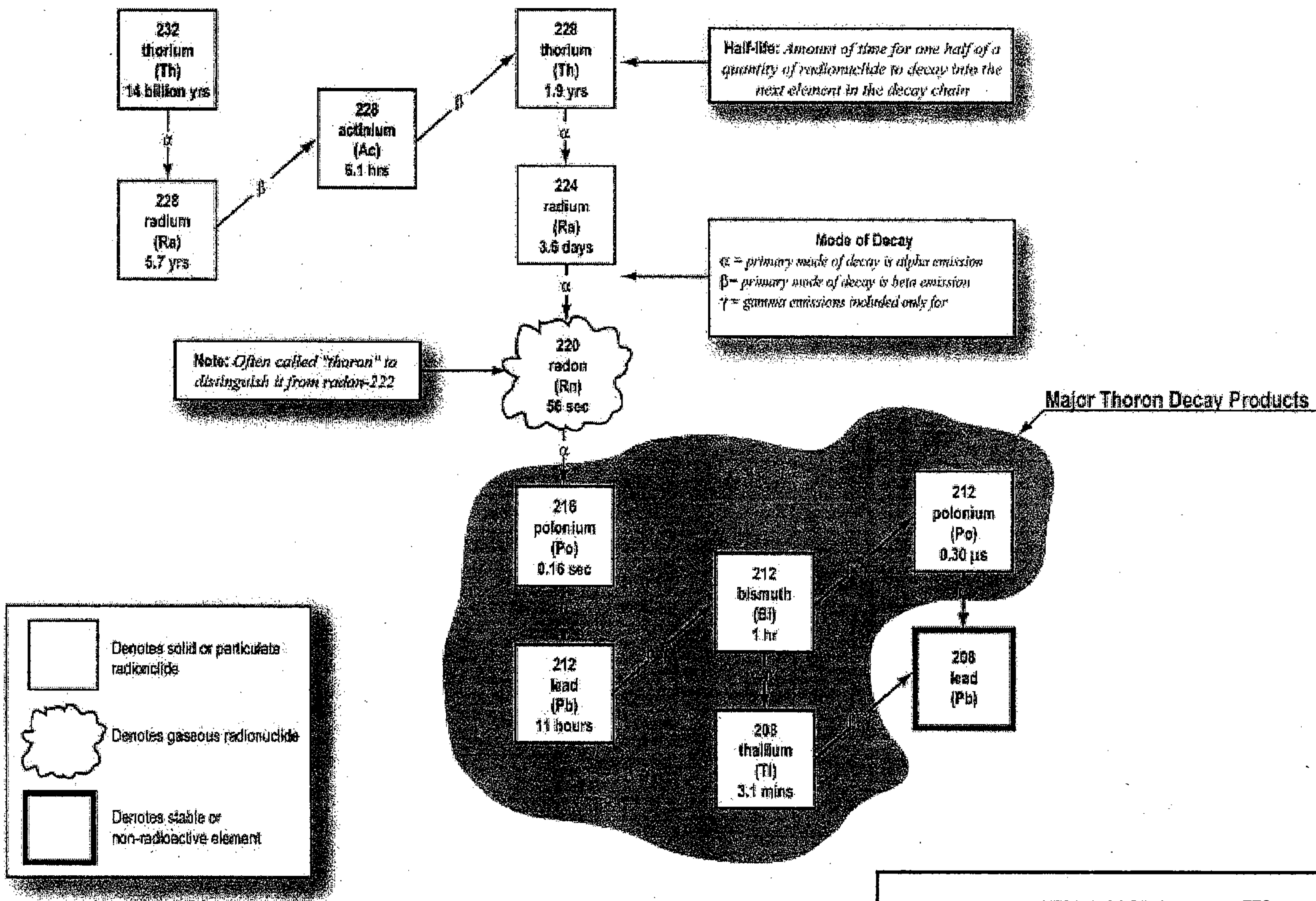
Kerr-McGee Sewage Treatment Plant Site



Exposure Medium	Exposure Route	Receptors: Terrestrial Species: Deer Mouse	Least Shrew	Raccoon	Mink	Mallard	American Robin	Great Blue Heron	species: Fish	Aquatic Biota
Surface Water	Ingestion	--	--	O	O	O	--	O	O	O
	Direct Contact	--	--	O	O	O	--	O	O	O
	Inhalation	--	--	--	--	--	--	--	--	--
Sediment	Ingestion	--	--	X	X	X	--	X	O	O
	Direct Contact	--	--	O	O	O	--	O	O	X
	Inhalation	--	--	O	O	O	--	O	--	--
Aquatic Biota	Ingestion	--	--	X	X	X	--	X	O	O
	Direct Contact	--	--	--	--	--	--	--	--	--
	Inhalation	--	--	--	--	--	--	--	--	--
Aquatic Vegetation	Ingestion	--	--	X	X	X	--	--	O	O
	Direct Contact	--	--	--	--	--	--	--	--	--
	Inhalation	--	--	--	--	--	--	--	--	--
Surface Soil	Ingestion	--	--	--	--	--	--	--	--	--
	Direct Contact	--	--	--	--	--	--	--	--	--
	Inhalation	--	--	--	--	--	--	--	--	--
Terrestrial Vegetation	Ingestion	--	--	--	--	--	--	--	--	--
	Direct Contact	--	--	--	--	--	--	--	--	--
	Inhalation	--	--	--	--	--	--	--	--	--
Terrestrial Biota	Ingestion	--	--	--	--	--	--	--	--	--
	Direct Contact	--	--	--	--	--	--	--	--	--
	Inhalation	--	--	--	--	--	--	--	--	--
Surface Water	Ingestion	O	O	O	O	O	O	O	O	O
	Direct Contact	O	O	O	O	O	O	O	O	X
	Inhalation	--	--	--	--	--	--	--	--	--
Sediment	Ingestion	--	--	X	X	X	--	X	O	O
	Direct Contact	--	--		O	O	O	O	O	X
	Inhalation	--	--	O	O	O	--	O	--	--
Aquatic Biota	Ingestion	--	--	X	X	X	--	X	O	O
	Direct Contact	--	--	--	--	--	--	--	--	--
	Inhalation	--	--	--	--	--	--	--	--	--
Aquatic Vegetation	Ingestion	--	--	X	X	X	--	--	--	--
	Direct Contact	--	--	--	--	--	--	--	--	--
	Inhalation	--	--	--	--	--	--	--	--	--

Legend:

X - Potentially complete exposure pathway (quantitatively evaluated)
O - Potentially complete exposure pathway but not evaluated quantitatively
-- - Not applicable or incomplete
(1) - Detected in sediments only (not analyzed for in soils and surface water)
(2) - Detected in surface soils, sediment and surface water
Dashed lines indicate theoretically complete pathways but unanalyzed media



SOURCE: CH2M HILL, 2003.

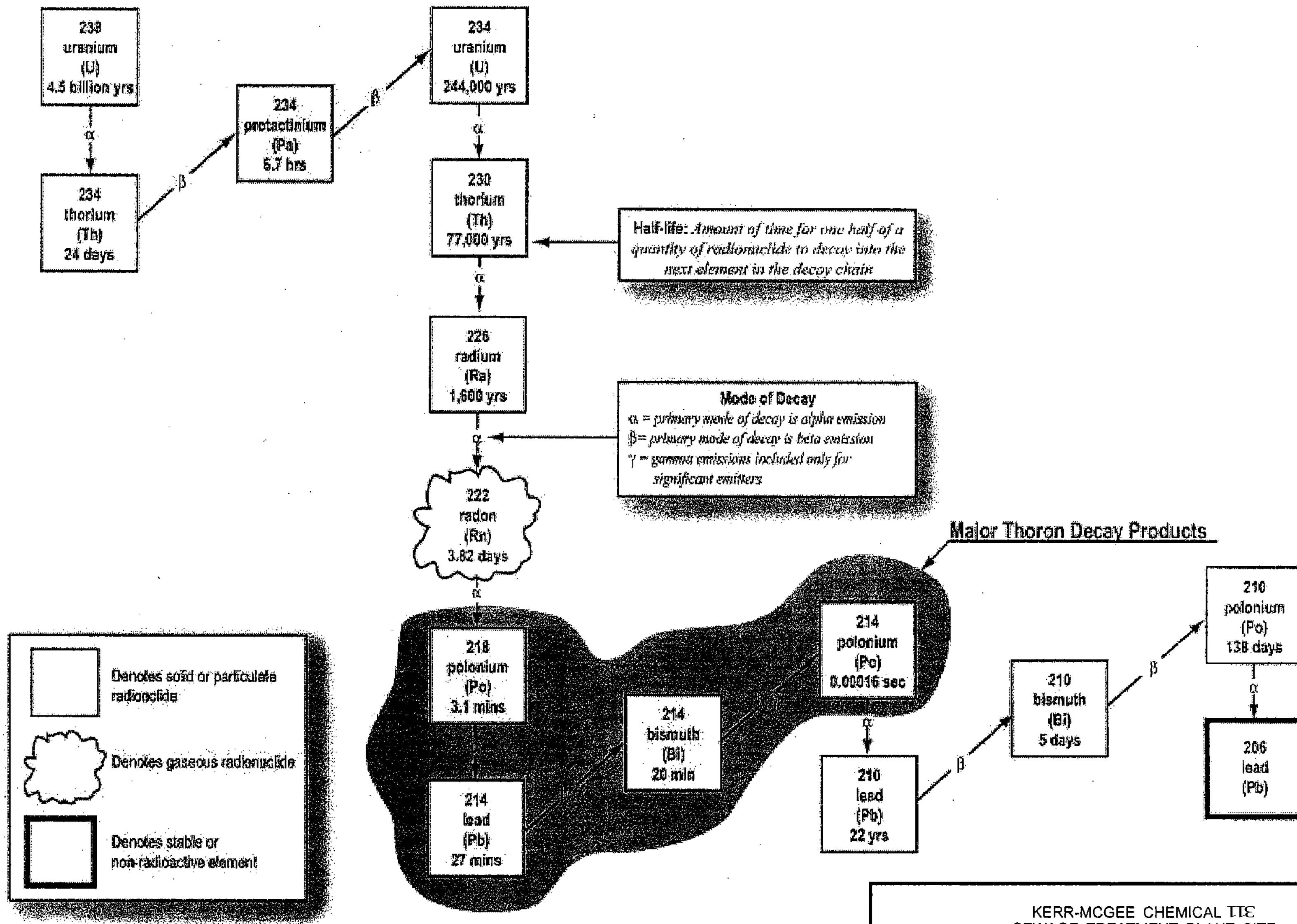
09/03/04 SYR-D85-DJH KFS LJP
71004012/71004g05.cdr

KERR-MCGEE CHEMICAL LLC
SEWAGE TREATMENT PLANT SITE

DECAY CHAIN FOR THORIUM-232

BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
9



KERR-MCGEE CHEMICAL LLC
SEWAGE TREATMENT PLANT SITE

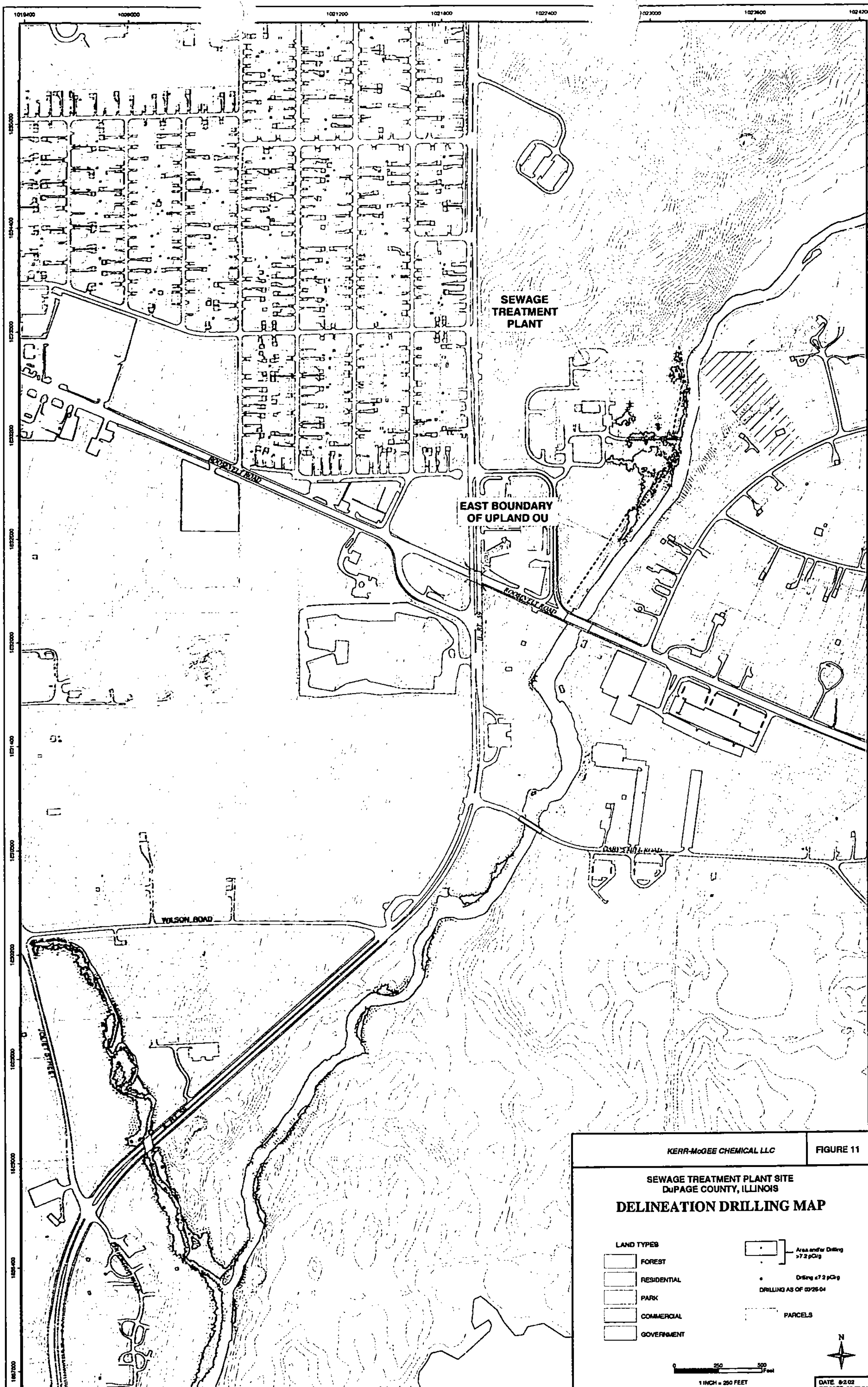
DECAY CHAIN FOR URANIUM-238

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
10

SOURCE: CH2M HILL, 2003.

09/03/04 SYR-D85-DJH KFS LJP
71004012/71004g06.cdr


SEWAGE TREATMENT PLANT
EAST BOUNDARY OF UPLAND OU
ROOSEVELT ROAD
WILSON ROAD
KERR-McGEE CHEMICAL LLC
FIGURE 11
SEWAGE TREATMENT PLANT SITE
DuPAGE COUNTY, ILLINOIS
DELINEATION DRILLING MAP
LAND TYPES
FOREST
RESIDENTIAL
PARK
COMMERCIAL
GOVERNMENT
Area and/or Drilling >7.2 pCi/g
Drilling ≤7.2 pCi/g
DRILLING AS OF 03/26/04
PARCELS
N
0 250 500 Feet
1 INCH = 250 FEET
COORDINATES ILLINOIS EAST NAD 83
DATE 8/2/02
REVISED 08/20/04
1019400
1020000
1020600
1021200
1021800
1022400
1023000
1023600
1024200

APPENDIX A

RESPONSIVENESS SUMMARY
for Kerr-McGee Sewage Treatment Plant Site

This Responsiveness Summary provides both a summary of the public comments U.S. EPA received regarding the Proposed Plan for the Sewage Treatment Plant Site and U.S. EPA's responses to those comments. The Proposed Plan was released to the public on May 24, 2004, and the public comment period ran from May 26 through June 25, 2004. U.S. EPA held a public meeting regarding the Proposed Plan on June 2, 2004, at Warrenville City Hall.

U.S. EPA received written comments (via regular and electronic mail) and verbal comments (at the public meeting) during the public comment period. In total, U.S. EPA received comments from approximately 30 different people. Copies of all the comments received (including the verbal comments reflected in the transcript of the public meeting) are included in the Administrative Record for the Site. U.S. EPA carefully considered all comments prior to selecting the final site remedy documented in the ROD.

This Responsiveness Summary does not repeat verbatim each individual comment. Rather, the comments are summarized and grouped by the type of issue raised. The comments fell within several different categories: support for the proposed remedy, public involvement in design and construction, project sequence and schedule, cleanup technologies/rationale, community impacts/quality of life factors (including short-term impacts during the cleanup), restoration issues, site characterization testing, health concerns, and legal and policy issues.

The remainder of this Responsiveness Summary contains the comments U.S. EPA received and U.S. EPA's responses to those comments, grouped by category.

SUPPORT FOR THE PROPOSED REMEDY

Several people expressed strong support for the proposed remedy for the river portion of the STP Site (Alternative 3: Excavation and Off-Site Disposal of Targeted Sediment/Soil Throughout the Site). The comments included the sentiments that Alternative 3 was "a no-brainer" and "the only acceptable option." Some people added that they have been waiting many years for the Site cleanup to start and one person said they now have a "ray of hope" that future generations will be protected from the radioactive contamination. One person also said that (1) this will be one of the best environmental cleanups ever conducted, (2) the thoroughness of the testing was "amazing," (3) he strongly supports the 7.2 pCi/g cleanup standard, (4) the cleanup is worth having despite the impacts and disruptions to the community during the cleanup, and (5) the permanent disposal site in Utah (where Kerr-McGee will ship the contaminated materials) is a good disposal alternative for the radioactive material.

No one expressed support for any of the other alternatives that U.S. EPA evaluated for the river portion of the STP Site, and no one said that they did not support Alternative 3. Also, no one commented on U.S. EPA's proposal for "No Further Action after completion of the ongoing removal action" at the upland portion of the STP Site.

U.S. EPA understands that there is strong community support for the removal of the radioactive contamination from the Site in general and for Alternative 3 in particular. Additionally, Alternative 3 represents the cleanup approach that representatives of the affected local communities (as defined in Section 2.3 of the ROD) and Kerr-McGee presented to U.S. EPA after several years of negotiations between those parties.

PUBLIC INVOLVEMENT IN DESIGN AND CONSTRUCTION

Several people inquired about the level of involvement and input that affected property owners would be afforded regarding decisions about the specific details of the construction and restoration work on their property. The comments made it clear that property owners want input into decisions that affect their property, including use of their property for possible support activities (such as staging areas) during the cleanup and particularly how the property will be restored after removal of the contamination. One person asked whether neighboring property owners will be notified about what is happening in their neighborhood, even if their property is not directly impacted by the cleanup.

One person made very specific recommendations for monitoring activities at the Site before, during and after construction activities, including specific recommendations about the media to be tested (air, surface water, groundwater), the frequency of the testing, the number and types of locations to be tested and the analysis to be performed. Further, the commenter expressed the opinion that the data should be collected and analyzed by an independent laboratory and that the data must be made public within 30 days of its collection. The commenter stated that the need for groundwater testing was reinforced because groundwater samples at the STP Site tested positive for radionuclides.

U.S. EPA and/or Kerr-McGee stated at the June 2, 2004, public meeting that property owners would be involved in discussions with Kerr-McGee regarding that work to be conducted on their property (including input into how the property would be restored). (Transcript of public meeting, pages 33, 34, 53, 67, 69, 80.) Additionally, in the portion of the STP ROD that describes the selected remedy (Section 12.2), U.S. EPA specifically states that "the owners of affected properties will be involved in detailed discussions regarding the work to be conducted on their property, and their concerns will be addressed in the final design to the extent practicable."

Regarding whether neighboring property owners will be notified about specific cleanup activities in their neighborhood, U.S. EPA intends to keep all interested members of the public informed about cleanup activities in their community and currently is involved in discussions with representatives of the local communities and various community groups regarding the best methods for disseminating information to the public at various stages of the cleanup project. U.S. EPA could make use of any of a number of methods to keep the community informed, including but not limited to public meetings, availability sessions, small neighborhood meetings, regular website updates, providing information for publication in various community newsletters, mailing fact sheets/progress reports, making all technical reports and documents (including final design documents) available in the library and/or online, and holding educational seminars for affected property owners regarding restoration options (including encouraging owners to select native plants as replacements for invasive species removed during the cleanup).

In terms of the monitoring that will be conducted as part of the cleanup, decisions about the monitoring that will be conducted will be made during the design phase following the ROD. Such monitoring will include, at a minimum, air monitoring and water column (surface water) monitoring. U.S. EPA will consider the specific suggestions it received during the public comment period, but notes that groundwater monitoring will not be a component of the monitoring program. Groundwater testing at the upland portion of the STP Site was conducted during the remedial investigation and even though water samples tested positive for radionuclides (as would be expected in any groundwater samples), groundwater is not a media of concern because neither radionuclides nor any other contaminant in groundwater posed unacceptable risks to human health or the environment. (Information in the Administrative Record for the STP Site provides more details regarding the groundwater results at the Site.) Monitoring of groundwater during the cleanup therefore is not necessary. All samples at the Site will be collected under a U.S. EPA-approved Quality Assurance Project Plan (specifying the specific field and laboratory procedures that will be used) and U.S. EPA will conduct oversight of Kerr-McGee's work at the Site to ensure that such field and laboratory procedures are followed. U.S. EPA (and/or the State) may collect split samples if deemed necessary. Additionally, all laboratories conducting sample analysis are subject to audit. U.S. EPA agrees to make all monitoring data available to the public as soon as practicable after it receives validated sample results/reports.

PROJECT SEQUENCE AND SCHEDULE

Several people commented on the project schedule and/or the sequence of activities for Site cleanup. One person said that the cleanup schedule appeared reasonable and wanted some assurance that Kerr-McGee would meet it. Another person asked whether the plan was to "leap-frog" from one contaminated spot to the next and whether uncontaminated areas of the sediments and banks would be addressed during the cleanup. One person said that downstream property owners with small amounts of contamination were being held hostage by the thorium and asked U.S. EPA to consider cleaning up those areas first rather than proceeding sequentially from upstream to downstream. Other people wondered how long the cleanup at each property would take and how long staging areas would need to stay in place.

U.S. EPA fully expects Kerr-McGee to conduct the cleanup and currently is negotiating the terms of a federal consent decree, including project schedule provisions. U.S. EPA will oversee all the cleanup work at the Site to ensure that Kerr-McGee meets the terms of the enforcement document, including project schedule deadlines.

Regarding the project sequence, the cleanup of the STP Site will proceed from upstream to downstream areas. The Site will be broken into two different sub-reaches based on physical characteristics and the extent of cleanup needed. All cleanup and restoration work will be completed in the upstream sub-reach before cleanup work starts in the downstream sub-reach. Uncontaminated areas of the river will not be addressed by the cleanup, but uncontaminated areas will be impacted by cleanup activities. For example, the downstream sub-reach (from Gary's Mill Road to the river's confluence with the creek) likely will be completely isolated and dewatered in order to conduct the cleanup, even though not all areas within that segment are contaminated. U.S. EPA notes, however, that any and all areas of the river that are disturbed or impacted by cleanup activities will be properly restored.

U.S. EPA carefully considered the suggestion that downstream property owners with small areas of contamination not be required to wait until all the upstream areas have been addressed, but that those small areas be cleaned up first. U.S. EPA acknowledges that some people have been waiting many years for this cleanup and have been unable to buy or sell property because of thorium contamination issues. However, because of the way the cleanup will be conducted, with an entire segment of the river completely isolated and dewatered, even small areas of contamination within those segments must wait to be cleaned up as part of the larger cleanup effort for that given sub-reach. Additionally, the entire cleanup of the river portion of the STP Site is expected to take only a few months.

The length of time needed for the cleanup of any particular property will depend largely on the amount of contamination located there. Property owners will be given more detailed information about the cleanup of their property (including the length of time needed to complete their property) during the detailed design phase. Similarly, the length of time needed for staging areas to remain in place depends on the specific needs for that reach of the Site and will be determined during the detailed design phase.

CLEANUP TECHNOLOGIES/RATIONALE

Several people commented on the various cleanup technologies that will/may be used at the Site and the rationale behind certain decisions. In particular, commenters asked (1) whether U.S. EPA had used similar "dry excavation" techniques at similar sites, (2) how stream flow will be diverted to dry up portions of the river, and (3) why it was necessary to disturb areas of contamination already buried beneath clean overburden materials.

Dry excavation techniques have been used at contaminated sediment sites in the past and U.S. EPA expects the use of those techniques at this Site to be successful. Some portions of the Site may need to use only sand bags/turbidity barriers to isolate small areas of contamination for excavation, while other portions of the river will need to be completely isolated and the flow of the river diverted around those areas. To accomplish this, sheet piling and/or earthen berms with pump bypass systems would probably be used. A pump bypass system would carry the water past each isolated section, and the isolated section would be dewatered or "dried up" by pumping the water out of the isolated area. The specific details regarding how this would be accomplished will be determined during the detailed design phase.

The STP Site ROD requires all targeted materials at the Site to be excavated and transported off-site for disposal, even those areas that are buried beneath layers of clean overburden material. This is due to the long-lived nature of the radioactive contamination at the Site, with thorium having a half-life of 14 billion years. As a result, the long-term effectiveness and permanence of any remedy that leaves contamination in place, even if currently buried under clean overburden materials, is questionable.

COMMUNITY IMPACTS/QUALITY OF LIFE FACTORS

More than a dozen people commented on issues related to impacts of the cleanup on the community and the quality of life along the river, including short-term impacts during the cleanup. In general, the comments dealt with loss of trees, shrubs and other vegetation, the impact of the cleanup on wildlife, the need for dust control measures, the need to prevent the spread of contamination during the cleanup (including during transportation of the contaminated materials off-site for disposal), monitoring during the cleanup to ensure that nearby residents and the surrounding environment are protected from the spread of contamination, damage to roads from heavy trucks, the impact of the cleanup/restoration on future flooding, the ability of property owners to sell their property when the cleanup is done, and the safety of the ultimate disposal site. Regarding the issue of trees, several people expressed concern with the loss of established trees along the banks of the creek/river, not only for aesthetic reasons but also related to erosion control issues. One person suggested that it would be better to leave some areas of contamination behind in order to save some trees, and U.S. EPA has had discussions with other property owners along the river (at the Kress Creek Site) who have very mature, desirable trees and share the same sentiment.

U.S. EPA considered possible short-term impacts associated with the cleanup as part of the Feasibility Study Report (which is included in the Administrative Record for the Site), and the ROD requires that steps be taken during the cleanup to mitigate such short-term effects. Disturbed areas of the Site will be restored as part of the cleanup, including revegetating banks/ floodplain areas, restoring stable banks and implementing appropriate erosion control measures. Property owners will be involved in decisions regarding how their property will be restored, including selecting which trees, shrubs or other vegetation will be planted to replace those that had to be removed. There will be short-term impacts to wildlife, but steps will be taken to mitigate these impacts as determined during the remedial design phase. For example, visible mussels will be relocated to other areas of the stream prior to excavation work occurring.

In certain limited instances where the owner wants to save a particular mature tree, it may be possible to do so by allowing some of the contaminated material to remain in place while still meeting the 7.2 pCi/g cleanup standard over a 100-square meter area (as allowed by the federal and state regulations upon which the cleanup standard is based). U.S. EPA will evaluate such instances on a case-by-case basis, and will consider such factors as the location, depth and concentration of the contaminated materials near the tree in making its determination.

Regarding dust control, preventing the spread of contamination and environmental monitoring, the ROD requires that appropriate engineering controls (such as dust control techniques) be used during the cleanup and that monitoring be conducted to evaluate short-term impacts from the construction activities and respond to them as needed. Cleanup of the Site by using dry excavation techniques will help prevent contamination from being "stirred up" and carried further downstream. Additional measures (as determined during the remedial design phase) will be implemented to prevent the spread of contamination from areas being excavated, areas used as staging areas, and any other areas being used for construction-related activities. Contaminated materials will be transported off-site by trucks covered with tarps, and steps will be taken to ensure that trucks leaving the site do not track any contamination off-site. Environmental monitoring will include, at a minimum, air monitoring and water column (surface water) monitoring, with the specific details of the monitoring program determined during the remedial design phase. (See earlier section entitled "Public Involvement in Design and Construction" for additional comments and responses related to environmental monitoring during the cleanup.)

Regarding possible damage to roads from heavy trucks, or any other damage to property that occurs as a result of the cleanup, any such damaged areas will be repaired and restored as part of the cleanup.

In terms of possible impacts of the cleanup/restoration work on future flooding, there are federal and state regulations that govern construction work in floodplain and stream areas. There are also local ordinances which are not legally binding on this cleanup but which will be considered as an importance guidance for site-related construction work. In general, federal agencies are required to evaluate the potential effects of any actions they may take in a floodplain and to avoid, to the extent possible, adverse effects associated with direct and indirect development of a floodplain. Federal agencies must avoid, to the extent possible, adverse impacts associated with the destruction or loss of wetlands, or to avoid or minimize adverse impacts if no practicable alternative exists. Illinois state laws also govern construction and filling in the floodway of rivers such as the West Branch DuPage River. These laws provide protection by restricting damageable floodplain improvements and uses which increase flood damage potential elsewhere. All cleanup and restoration work will comply with the applicable or relevant and appropriate requirements of these regulations. If contaminated areas of the river are dug out and not filled back in, it is unlikely that this would improve the flood-carrying capacity of the river.

After the cleanup is completed at the STP Site, U.S. EPA intends to send a letter to each affected property owner documenting that their property has been cleaned up. Receipt of such letters should make it easier for people to sell their property in the future.

One person expressed concern with concentrating all the radioactive contamination at one disposal site, in the event of a terrorist strike on that site. In response, U.S. EPA notes that the disposal site in Utah is located in a very remote, unpopulated location, and the site handles only low-level radioactive waste. The likelihood of a terrorist strike on the disposal site is probably very low.

RESTORATION ISSUES

More than ten different people commented on issues related to site restoration after the cleanup. The issues raised dealt with wetland mitigation, how the river bed will be left after the cleanup, how river banks and floodplain areas will be restored and how to prevent future erosion, the loss of wildlife habitat and possible takeover by invasive plant species, how to convince property owners to select more natural/native plant species and the need for public education regarding proper restoration choices, whether sheetpiling installed during the cleanup will be removed or left in place, how property owners can benefit from the restoration negotiations that already have occurred between Kerr-McGee and the affected communities (including particularly the Forest Preserve District), and who will be responsible for restoration efforts and ensuring that the restoration succeeds.

U.S. EPA notes that Kerr-McGee is in the process of making final revisions to a *Conceptual Mitigation and Restoration Design Plan* for the Site that will describe the conceptual approach for restoration and mitigation efforts at different types of properties/areas. The conceptual plan was developed with significant input from representatives of the local communities (particularly the Forest Preserve District), U.S. EPA, and federal and state natural resource trustees, and addresses the mitigation and restoration of the following areas/property types: streambank and riparian areas (general concepts), commercial/residential property, wetlands, DuPage County Forest Preserve property, and aquatic habitat. It also addresses required maintenance and monitoring of restored areas. In general, the conceptual plan was designed to restore habitats of similar characteristics and environmental functions, but at the same time make minor modifications that either benefit the environment or meet the needs of individual property owners. When finalized, the plan will be available to members of the public. Readers are encouraged to review the plan (when finalized) for more detailed information about restoration issues.

Regarding wetlands, the commenter wanted to know whether mitigation efforts would be conducted on-site or off-site and what mitigation ratios would be used. U.S. EPA understands that the Forest Preserve District has volunteered to take on all the obligations for wetland mitigation on forest preserve property at a ratio of 1:5 to 1. This mitigation ratio is considered appropriate since no high quality wetlands have been identified at the Site in the areas subject to remediation activities. Actual mitigation locations and whether those locations will be on-site or off-site have not yet been determined.

Regarding the final condition of the streambed, the removal of channel sediments and the use of dewatered areas of the river to access the removal areas can disturb in-stream structures or riffle/pool complexes that provide habitat for a number of fish species. As part of the cleanup, disturbed in-stream structures or habitat complexes will be mitigated and restored to maintain, and when feasible, improve, the quantity and diversity of habitats that currently exist.

The cleanup also will disturb floodplain areas and sections of river banks, and some people expressed concerns that removing mature trees along the banks (when necessary) would make the banks more prone to erosion. During Site restoration, affected banks will be properly sloped and, if necessary, provided with additional engineered or bioengineered protections to prevent scouring and undercutting. Multiple restoration options will be available during the detailed design phase depending on location, land use, proximity of nearby structures, and stream characteristics, all with the goal of achieving stable stream banks, preferably with native vegetation where appropriate. Impacted floodplain areas and upland areas will be revegetated in accordance with final restoration decisions made during the detailed design phase (including input from the property owner).

During the remedial design phase, the restored streambank configurations of the Site will be hydraulically simulated using DuPage County's then current Full Equations Model (FEQ model). Cross sectional data utilized in the FEQ model will be collected from the Site as needed to develop the model. The restoration will be designed to result in "No Net Fill" within the floodplain and no increase in flood profiles greater than 0.04 feet. Also as part of detailed design efforts, the hydraulic model will be applied to locations at the Site with high energy erosion potential to evaluate a range of erosion protection requirements under a range of flows. These evaluations and input from property owners will serve as the basis for preparation of bank restoration design specifications.

The restoration of vegetation (which provides habitat for animals) in disturbed areas above the stream bank will be designed considering property owner requests. Any removed trees and shrubs will be replaced, unless the property owner elects not to seek replacement. Mature trees obviously can not be replaced with mature trees, but will be replaced with root-bagged stock. Property owners will be encouraged to select non-invasive species as a replacement for any invasive species that are removed, but the final decision will belong to the property owner. Monitoring of restored areas will be conducted and maintenance activities will be implemented based upon certain performance standards (including control of invasive species).

As mentioned above, U.S. EPA will encourage property owners to select non-invasive species as replacements for plants that were removed. U.S. EPA agrees that public education regarding proper/ecologically-sound restoration choices would be very beneficial to this cleanup project, and is currently engaged in discussions with representatives of the local communities and various community groups regarding that topic (among others, as described above in the section entitled "Public Involvement in Design and Construction").

Regarding sheetpiling installed during the cleanup to isolate contaminated areas or stabilize steep slopes, it is anticipated that such sheetpiling will be removed unless it is deemed essential for continued stability.

Property owners will benefit from the restoration negotiations that already have occurred between Kerr-McGee and representatives of the local communities. The restoration options contained in the *Conceptual Mitigation and Restoration Design Plan* were developed as a "best practices" approach to stream bank stabilization and restoration, and the conceptual plan (when finalized) will be used as a template for all properties, including private residential properties. Kerr-McGee will be responsible for restoration efforts and for monitoring and maintaining the restored areas in accordance with the *Conceptual Mitigation and Restoration Design Plan* (when finalized) and the performance standards contained in that plan.

U.S. EPA notes that, in general, restoration work to impacted areas will be conducted in accordance with how the property owner wants the area restored. However, all cleanup and restoration work must comply with all applicable or relevant and appropriate requirements. (This issue is discussed further below in the section entitled "Legal and Policy Issues.")

SITE CHARACTERIZATION TESTING

A few people made comments regarding site characterization testing issues. One person wondered where property owners can obtain the data/results from the testing of their properties. Another person asked whether any testing was done for alpha or beta radiation besides the gamma radiation testing that was conducted.

Property owners can obtain their specific testing results by contacting U.S. EPA's Remedial Project Manager, Rebecca Frey (312-886-4760). U.S. EPA will obtain the information from Kerr-McGee in an easily-understood form and will then send it to the property owner. Additionally, property owners whose property will be involved in the cleanup will be contacted by Kerr-McGee during the remedial design phase and will be involved in detailed discussions about the work to be conducted on the property. During those discussions, Kerr-McGee will present information to the owner that shows the areas of the property that need to be cleaned up.

Both U.S. EPA and Kerr-McGee conducted testing at the STP Site, and due to the characteristics and properties of the thorium contamination, all testing focused on gamma radiation. Testing for alpha and beta radiation was not conducted and is not necessary.

HEALTH CONCERNS

A few people made comments related to various health issues and the risks associated with the thorium contamination at the Site. Concerns included whether it is safe to (1) drink water from private wells, (2) eat fish from the river, (3) use the parks along the Site, (4) eat fruit or vegetables from gardens or wild bushes along the Site, or (5) use the river for recreational purposes. Similar concerns were raised regarding possible exposure from the Site to family pets (e.g., dogs swimming in the river), and people wondered whether they would be contacted with the results from their property. One person wondered whether, until such time as the Site is cleaned up, access to the river and other areas with contamination should be closed to prevent exposure to the contamination, because U.S. EPA's risk assessment showed that recreational use of the Site posed unacceptable risks to human health.

Although U.S. EPA's risk assessment showed that recreational use of the Site posed unacceptable risks to human health and the environment, the risk assessment made some very conservative assumptions about the recreational use scenario that was evaluated. In particular, U.S. EPA assumed that all of the contamination identified at the Site was available at the surface of the land (out of the water) and readily available for exposure to humans, despite the fact that some of the contamination is located in the sediments at the bottom of the stream and/or buried beneath layers of clean overburden materials. Additionally, U.S. EPA assumed that a recreational user of the Site would be exposed to the radioactive contamination (even though, as stated above, not all of it is readily accessible) for 54 days each year for 30 consecutive years. As a result of these assumptions, U.S. EPA believes that its risk assessment provides a conservative estimate of site risks to be protective of the most vulnerable persons who may represent the "reasonable *maximum* exposure scenario." The risk estimates do not represent the risks to each and every visitor to the Site or adjacent areas, and the actual exposure to casual/occasional visitors to the Site (including family pets who swim in the river) is, in all likelihood, negligible.

U.S. EPA also collected and analyzed fish samples and calculated the risks to people from eating the fish. Eating fish from the Site does not pose an unacceptable risk to human health. Although plants can take up contamination (and those risks also were evaluated in the risk assessment and found to be negligible), the plants would have to be growing directly in contaminated areas. U.S. EPA recommends that people not plant gardens in areas they know to be contaminated. If property owners want to know for sure that their gardens are not located in contaminated areas, they can call the U.S. EPA Remedial Project Manager, Rebecca Frey (312-886-4760) and she will arrange for testing to confirm that the garden area is not contaminated.

Thorium contamination is very insoluble and stays bound to soil and sediment instead of dissolving in water. Therefore, neither surface water nor ground water are media of concern at the Site and drinking water will not be impacted by the thorium contamination at the Site. (Prior testing of private residential wells at properties with extensive soil contamination has confirmed this.)

Based on all of the above information, U.S. EPA has determined that there is no need to restrict access to the Site, prevent people from fishing in the river, prevent recreational use of the river, or close parks or other areas that have contamination.

LEGAL & POLICY ISSUES

Several people made comments that dealt with various legal or policy issues associated with the cleanup. One person wanted to make sure that the cleanup will comply with the rules and regulations governing the West Branch DuPage River and its floodplain, particularly those dealing with structures. Another person wondered why U.S. EPA isn't ordering Kerr-McGee to conduct the cleanup. The Illinois EPA clarified that the letters U.S. EPA intends to send property owners following the cleanup of their property are different from the types of "No Further Remediation" (NFR) letters issued by the State of Illinois for the Site Remediation Program pursuant to Ill. Admin. Code 740 and the Leaking Underground Storage Tank Program pursuant to Ill. Admin. Code Part 732.

Regarding compliance with the law, the cleanup must comply with all applicable or relevant and appropriate requirements (ARARs). ARARs are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that either (1) specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a Superfund site and are legally applicable, or (2) while not legally applicable, address problems or situations sufficiently similar to those encountered at the Superfund site that their use is well-suited to the site (i.e., relevant and appropriate). In addition to ARARs, guidance materials that have not been promulgated or other regulatory standards (such as local/county requirements) may be considered and used during the cleanup. Lists of the ARARs for the STP Site are included in Tables 19, 20 and 21 of the STP Site ROD. Rules and regulations contained in those tables that govern the West Branch DuPage River and its floodplain (including those dealing with structures) must be complied with during all cleanup and restoration work. Existing structures that are removed by the cleanup can be replaced to the extent allowed by and in accordance with the substantive requirements of current law. Kerr-McGee will not be responsible for "fixing" an existing structure that is not impacted by the cleanup.

U.S. EPA has not ordered Kerr-McGee to conduct the cleanup because a remedy for the Site must first be selected. This ROD selects the remedy for the Site, so U.S. EPA could now order Kerr-McGee to do the cleanup. U.S. EPA currently is negotiating with Kerr-McGee and anticipates signing a federal consent decree under which Kerr-McGee will agree to conduct the cleanup.

U.S. EPA notes the clarification from Illinois EPA regarding their NFA Letters and has included their comment letter in the Administrative Record for the Site.

APPENDIX B

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
KERR-MCGEE SEWAGE TREATMENT PLANT
WEST CHICAGO, ILLINOIS

ORIGINAL
MAY 24, 2004

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	05/02/91	Blanchard, S., U.S. DOI/ USGS	Schaffer, G., U.S. EPA; et al.	Memorandum re: Anomalous Concentrations of Thorium and Selected Rare-Earth Elements in Stream-Bed Sediments in the West Branch of the DuPage River and Kress Creek w/ Attachments	11
2	07/23/92	Schafer, G., U.S. EPA	Ayers, T., Illinois EPA	Letter re: Request for Comments on the Draft RI/FS Workplans for the West Chicago Sewage Treatment Plant and Reed-Keppler Park Sites	1
3	07/23/92	Schafer, G., U.S. EPA	Ed, D., IDNS	Letter re: Request for Comments on the Draft RI/FS Workplans for the West Chicago Sewage Treatment Plant and Reed-Keppler Park Sites	1
4	08/11/92	U.S. EPA	CH2M Hill	Statement of Work for Conducting a RI/FS at the Kerr-McGee West Chicago Sewage Treatment Plant Site	26
5	10/05/92	CH2M Hill	U.S. EPA	Work Plan for the RI/FS at the Kerr-McGee Sewage Treatment Plant	73
6	11/25/92	Traub, J., U.S. EPA	Netzel, P., City of West Chicago	Letter re: U.S. EPA's Request for Access to the Reed-Keppler Park and Sewage Treatment Plant for RI/FS Studies w/ Attachments	9
7	12/00/92	CH2M Hill	U.S. EPA	Health and Safety Plan for the West Chicago Sewage Treatment Plant	39
8	12/00/92	CH2M Hill	U.S. EPA	Quality Assurance Project Plan for the Kerr-McGee Sewage Treatment Plant and Reed-Keppler Park Sites	369

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
9	12/14/92	Foster, J., City of West Chicago	Traub, J., U.S. EPA	Letter re: City of West Chicago's Response to U.S. EPA Request for Access to Reed-Keppler Park and the Sewage Treatment Plant w/ Attachments	14
10	01/06/93	Adamkus, V., U.S. EPA	Netzel, P., City of West Chicago	Unilateral Order for Access for the Reed-Keppler Park Quarry and the West Chicago Sewage Treatment Plant w/ Cover Letter	8
11	01/14/93	Foster, J., City of West Chicago	Radell, M., U.S. EPA	Letter re: City of West Chicago's Response to U.S. EPA's Unilateral Administrative Order for Access to Reed-Keppler Park and the West Chicago Sewage Treatment Plant	2
12	02/00/93	U.S. EPA	Public	Fact Sheet: U.S. EPA Begins Studies at the Reed-Keppler Park and Sewage Treatment Plant	8
13	09/30/93	CH2M Hill	U.S. EPA	Final Source Characterization and Hydrological Assessment for the Kerr-McGee Sewage Treatment Plant Site	270
14	08/00/94	CH2M Hill	U.S. EPA	Quality Assurance Project Plan Addendum for the RI/FS at the Kerr-McGee Sewage Treatment Plant and Reed-Keppler Park Sites	277
15	08/29/94	CH2M Hill	U.S. EPA	Revised Work Plan Revision Request No. 1 for the RI/FS at the Kerr-McGee Sewage Treatment Plant West Branch DuPage River Site	120
16	09/00/94	U.S. EPA	Public	Fact Sheet: Update on U.S. EPA's Activities at the West Chicago Sewage Treatment Plant and Reed-Keppler Park Superfund Sites	6

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17	03/02/95	CH2M Hill	U.S. EPA	Source Characterization and Hydrologic Assessment for the Kerr-McGee Sewage Treatment Plant/West Branch DuPage River Site	55
18	01/12/99	Lakics, S., City of West Chicago; et al.	Fulghum, M., U.S. EPA	Letter re: City of West Chicago, DuPage County and DuPage County Forest Preserve District Comments on Land Use w/ Attachments	10
19	07/23/99	Bono Consulting	Kerr-McGee Chemical LLC	Investigation Work Plan for the Kress Creek/West Branch DuPage River Site	450
20	09/15/00	Roy F. Weston, Inc.	Kerr-McGee Chemical LLC	Screening-Level Problem Formulation and Ecological Effects Evaluation Report for Kress Creek	28
21	02/08/02	Hastert, J., U.S. Congress	Ullrich, D., U.S. EPA	FAX Transmission re: Kress Creek Information	8
22	09/11/02	Magel, B., Karaganis, White & Magel, Ltd.	Frey, R., U.S. EPA	Letter Forwarding Intergovernmental Agreement Entered Into by the City of West Chicago, City of West Chicago Park District, City of Warrenville, DuPage County and the DuPage County Forest Preserve District	48
23	10/00/02	Dinkins Biological Consulting	Weston Solutions, Inc.	Summary of Aquatic and Terrestrial Resource Surveys in Kress Creek	26
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25	12/12/02	Frey, R., U.S. EPA	Krippel, M., Kerr-McGee Chemical LLC	Letter re: U.S. EPA's Approval of the September 30, 1993 and March 2, 1995 Technical Memoranda for the Kerr-McGee Sewage Treatment Plant NPL Site	2

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26	2003-2004	Krippel, M., Kerr-McGee Chemical LLC	Frey, R., U.S. EPA	Progress Reports for the Period November 2003-April 2004 for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	12
27	2003-2004	Krippel, M., Kerr-McGee Chemical LLC	Mitchell, J., U.S. EPA	Progress Reports for the Period November 2003-April 2004 for the Kerr-McGee Upland Portion Sewage Treatment Plant Site	29
28	2003-2004	U.S. EPA	File	Minutes from the West Chicago Intergovernmental Forum for the Period October 2003-April 2004	36
29	02/21/03	Frey, R., U.S. EPA	Holmberg, H., Kerr-McGee Chemical LLC	Letter re: U.S. EPA's Comments on the Draft Characterization Report for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	7
30	03/10/03	Frey, R., U.S. EPA	Addressees	Memorandum re: Results of Chemical Samples Collected by the U.S. EPA at the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	2
31	07/15/03	Krippel, M., Kerr-McGee Chemical LLC	Frey, R., U.S. EPA	Letter re: Request for U.S. EPA Approval of the Investigation Work Plan for the Kress Creek/West Branch DuPage River Site	3
32	08/00/03	Blasland, Bouck & Lee, Inc.	U.S. EPA	BBL Quality Management Plan	164
33	08/26/03	Frey, R., U.S. EPA	Krippel, M., Kerr-McGee Chemical LLC	Letter re: U.S. EPA's Approval of the Investigation Work Plan for the Kress Creek/West Branch DuPage River Site	2
34	10/10/03	U.S. DOJ	Kerr-McGee Chemical LLC	Agreement in Principle Relating to the Kerr-McGee West Chicago NPL Sites	7

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35	11/14/03	Holmberg, H., Kerr-McGee Corporation	Frey, R., U.S. EPA	Cover Letter Forwarding the Draft Feasibility Study Report for the Kress Creek and Sewage Treatment Plant Sites	1
36	11/18/03	Frey, R., U.S. EPA	Addressees	E-Mail Transmission re: Request for Comments on the Draft Feasibility Study Report for the Kress Creek and Sewage Treatment Plant Sites	1
37	11/19/03	Frey, R., U.S. EPA	Addressees	E-Mail Transmission re: Request for Comments on the Draft Feasibility Study Report for the Kress Creek and Sewage Treatment Plant Sites	1
38	11/19/03	O'Malley, D.	Frey, R., U.S. EPA	E-Mail Transmission re: Deer and Thorium	2
39	11/20/03	O'Malley, D.	Frey, R., U.S. EPA	E-Mail Transmission re: Deer Thorium Test	2
40	11/21/03	U.S. EPA	Kerr-McGee Chemical LLC	Administrative Order by Consent for the Kerr-McGee Kress Creek/West Branch Dupage River and Sewage Treatment Plant Sites	43
41	12/02/03	Holmberg, H., Kerr-McGee Corporation	Frey, R., U.S. EPA	Cover Letter Forwarding the Draft Remedial Investigation Report for the Kress Creek and Sewage Treatment Plant Sites	1
42	12/03/03	Frey, R., U.S. EPA	Addressees	E-Mail Transmission re: Request for Comments on the Draft Remedial Investigation Report for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites	1
43	12/05/03	Krippel, M., Kerr-McGee Chemical LLC	Frey, R., U.S. EPA	E-Mail Transmission Forwarding the Submittal Letter and Electronic Version of the BBL Quality Management Plan w/ Attachments	3

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45	12/09/03	Meister, S., Forest Preserve District of DuPage County	Caspary, M., Illinois Emergency Management Agency	Letter re: Eight Muscle Samples from White-Tailed Deer in DuPage County	1
46	12/18/03	Allen, R., Illinois Emergency Management Agency	Meister, S., Forest Preserve District of DuPage County	Letter re: Analyses of Eight Muscle Samples from White-Tailed Deer in DuPage County	1
47	12/22/03	Frey, R., U.S. EPA	Addressees	E-Mail Transmission re: Request for Comments on Draft Ecological Risk Assessment and Draft Human Health Risk Assessment for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites	1
48	01/00/04	ProSource Technologies, Inc.	Kerr-McGee Chemical LLC	Characterization Report for the Kress Creek/ West Branch DuPage River Site (12 Volumes)	4080
49	01/15/04	Frey, R., U.S. EPA	File	Memorandum re: Documentation of EPA's Prior Approval of the BBL Quality Management Plan w/ Attachments	9
50	01/15/04	Frey, R., U.S. EPA	Krippel, M., Kerr-McGee Chemical LLC	Letter re: U.S. EPA's Approval of the BBL Quality Management Plan	1
51	02/26/04	Holmberg, H., Kerr-McGee Corporation	Frey, R., U.S. EPA	Letter Forwarding the Revised Characterization Report and Response to U.S. EPA's February 21, 2003 Comments on the Characterization Report for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites	12

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53	05/00/04	Blasland, Bouck & Lee,	U.S. EPA	Feasibility Study Report for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	89
54	05/00/04	Blasland, Bouck & Lee,	U.S. EPA	Remedial Investigation Report for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	439
55	05/00/04	CH2M Hill	U.S. EPA	Final Ecological Risk Assessment for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	120
56	05/00/04	CH2M Hill	U.S. EPA	Final Human Health Risk Assessment for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	173
57	05/00/04	U.S. EPA	Public	Fact Sheet: EPA Proposes Cleanup Plan for Radioactive Contamination at the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	14
58	05/13/04	Frey, R., U.S. EPA	Williams, T., Illinois EPA	Letter re: U.S. EPA's Request for State ARARs for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites w/ Attachment	12
59	05/18/04	Holmberg, H., Kerr-McGee Corporation	Frey, R., U.S. EPA	Cover Letter Forwarding the Remedial Investigation and Feasibility Study Reports for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	1

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60	05/20/04	Frey, R., U.S. EPA	Holmberg, H., Kerr-McGee Chemical LLC	Letter re: U.S. EPA's Approval of the January 2004 Revised Characterization Report for the Kerr-McGee Kress Creek/ West Branch DuPage River Site	1
61	05/20/04	Frey, R., U.S. EPA	Holmberg, H., Kerr-McGee Chemical LLC	Letter re: Final Human Health and Ecological Risk Assessment Reports for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	1
62	05/20/04	Frey, R., U.S. EPA	Holmberg, H., Kerr-McGee Chemical LLC	Letter re: U.S. EPA's Approval of the Final Remedial Investigation and Feasibility Study Reports for the Kerr-McGee Kress Creek/West Branch DuPage River and Sewage Treatment Plant Sites	1

U.S. EPA ADMINISTRATIVE RECORDS

DOCUMENTS CONTAINED ON THE INDICES ARE INCORPORATED BY REFERENCE INTO THE ADMINISTRATIVE RECORD FOR REMEDIAL ACTION AT THE KERR-MCGEE SEWAGE TREATMENT PLANT SITE

1	02/23/89	U.S. EPA	Public	Administrative Record for the Kerr-McGee Sites (Original)	28
2	11/18/94	U.S. EPA	Public	Administrative Record for Removal Action at the Kerr-McGee Residential Areas Site (Original)	7
3	07/10/03	U.S. EPA	Public	Administrative Record for Remedial Action at the Kerr-McGee Residential Areas Site (Original)	8
4	09/29/93	U.S. EPA	Public	Administrative Record for Remedial Action at the Kerr-McGee Residential Areas Site (Update #1)	2

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5	10/07/03	U.S. EPA	Public	Administrative Record for Removal Action at the Kerr-McGee Sewage Treatment Plant Upland Operable Unit (Original)	3

GUIDANCE DOCUMENTS

U.S. EPA GUIDANCE DOCUMENTS ARE INCORPORATED BY REFERENCE INTO THE ADMINISTRATIVE RECORD FOR REMEDIAL ACTION AT THE KERR-MCGEE SEWAGE TREATMENT PLANT SITE

1	10/00/86	U.S. EPA/ OERR	U.S. EPA	The Superfund Public Health Evaluation Manual (EPA 540/1-86-060)	
2	10/00/88	U.S. EPA/ OSWER	U.S. EPA	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA: Interim Final (OSWER Directive 9355.3-01)	
3	00/00/89	U.S. EPA/ OSWER	U.S. EPA	Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part A [Final] (OSWER Directive 9285.701A)	
4	00/00/91	U.S. EPA/ OERR	U.S. EPA	Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part B [Interim] (OERR Publication 9285.7-01B)	
5	03/00/91	U.S. EPA/ OSWER	U.S. EPA	Risk Assessment Guidance for Superfund: Human Health Evaluation Manual Supplemental Guidance, "Standard Default Exposure Factors" [Interim Final] (OSWER Directive 9285.6-03)	
6	00/00/93	U.S. EPA	U.S. EPA	Wildlife Exposure Factors Handbook: Volume 1 (EPA/ 600/R-93/187a)	
7	04/00/96	U.S. EPA/ OERR	U.S. EPA	Soil Screening Guidance (EPA/540/R-96/018)	
8	00/00/97	U.S. EPA/ OAR	U.S. EPA	Health Effects Assessment Summary Tables for Radio-nuclides	

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9	00/00/97	U.S. EPA	U.S. EPA	Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments [Interim Final] (EPA/540/R-97/006)	
10	04/00/98	U.S. EPA/ Office of Water	U.S. EPA	EPA's Contaminated Sediment Management Strategy (EPA 823-R-98-001)	
11	07/00/98	U.S. EPA/ OSWER	U.S. EPA	Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities [3 Volumes] (EPA 530-D-98-001A-C)	
12	00/00/99	U.S. EPA	U.S. EPA	Cancer Risk Coefficients for Environmental Exposure to Radionuclides	
13	10/07/99	Luftig, S., U.S. EPA/ OSWER	U.S. EPA	Memorandum re: Issuance of Final Guidance for Ecological Risk Assessment and Risk Management Principles for Superfund Sites (OSWER Directive 9285.7-28 P)	
14	07/00/00	U.S. EPA	U.S. EPA	A Guide to Developing and Documenting Cost Estimates During the Feasibility Study (EPA 540-R-00-002)	
15	00/00/01	U.S. EPA/ OERR	U.S. EPA	Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part D, Standardized Planning, Reporting and Review of Superfund Risk Assessments [Final] (OERR Publication 9285.7-47)	
16	00/00/01	U.S. EPA/ OERR	U.S. EPA	Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment [Interim] (EPA/540/R/99/005)	

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17	02/12/02	Horinko, M., U.S. EPA/ OSWER	U.S. EPA	Memorandum re: Principles for Managing Contaminant Sediment Risks at Hazardous Waste Sites (OSWER Directive 9285.6-08)	
18	06/11/02	Fisher, L., U.S. EPA	U.S. EPA	Contaminated Sediments Action Plan w/ Cover E-Mail Transmission	
19	11/00/02	U.S. EPA/ OSWER	U.S. EPA	Contamination Sediment Remediation Guidance for Hazardous Waste Sites [Draft] (OSWER 9355.0-85)	
20	03/05/04	Cook, M., U.S. EPA/ OSWER	U.S. EPA	Memorandum re: OSRTI Sediment Team and NRRB Coordination at Large Sediment Sites (OSWER Directive 9285.6-11)	

UPDATE #1
SEPTEMBER 29, 2004

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	05/25/04	Daily Herald	Public	U.S. EPA Public Notice: Public Meeting and Comment Period for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites	
2	05/27/04	Press/ Post	Public	U.S. EPA Public Notice: Public Meeting and Comment Period for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites	
3	06/01/04	Daily Herald	Public	U.S. EPA Public Notice: Public Meeting and Comment Period for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites	
4	06/02/04	Kruse & Associates,	U.S. EPA	Transcript of U.S. EPA June 2, 2004 Proposed Cleanup Plan for Radioactive Contamination Public Meeting	
5	06/02/04	U.S. EPA	File	Transparency Copies of Slides from U.S. EPA Presentation at the June 2, 2004 Proposed Plan Public Meeting	

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6	06/09/04	Krippel, M., Kerr-McGee Chemical LLC	Mitchell, J., U.S. EPA	Letter re: Progress Report for May 2004 for the Kerr-McGee Upland Portion Sewage Treatment Plant Site	
7	06/15/04	Williams, T., Illinois EPA	Hill, S., U.S. EPA	Letter re: Illinois EPA Comments on the Proposed Plan for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites	
8	06/18/04	U.S. EPA	File	Minutes from the June 18, 2004 West Chicago Intergovernmental Forum	
9	06/22/04	Krippel, M., Kerr-McGee Chemical LLC	Mitchell, J., U.S. EPA	Letter re: Notice of Force Majeure Event at the Kerr-McGee Upland Portion Sewage Treatment Plant Site	
10	05/25/04-06/25/04	Concerned Citizens	U.S. EPA	Public Comments on the Proposed Plan for the Kerr-McGee Kress Creek and Sewage Treatment Plant Sites	
11	06/30/04	Mitchell, J., U.S. EPA	Krippel, M., Kerr-McGee Chemical LLC	Letter re: U.S. EPA Response to Kerr-McGee's Request for an Extension to the Excavation and Restoration Deadline Stipulated in the AOC for the Kerr-McGee Upland Portion Sewage Treatment Plant Site	
12	07/09/04	Krippel, M., Kerr-McGee Chemical LLC	Mitchell, J., U.S. EPA	Letter re: Progress Report for June 2004 for the Kerr-McGee Upland Portion Sewage Treatment Plant Site	
13	08/09/04	Krippel, M., Kerr-McGee Chemical LLC	Mitchell, J., U.S. EPA	Letter re: Progress Report for July 2004 for the Kerr-McGee Upland Portion Sewage Treatment Plant Site	
14	08/11/04	Frey, R., U.S. EPA	File	Memorandum re: Radiological Groundwater Samples at Kerr-McGee Sewage Treatment Plant Site	

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15	08/20/04	U.S. EPA	File	Minutes from the August 20, 2004 West Chicago Intergovernmental Forum	
16	09/09/04	Krippel, M., Kerr-McGee Chemical LLC	Mitchell, J., U.S. EPA	Letter re: Progress Report for August 2004 for the Kerr-McGee Upland Portion Sewage Treatment Plant Site	